

Appendix D

Multivariate Data Analysis

The nine days of surf noise data and the Unit 4 shutdown and restart data were analyzed using multivariate statistical techniques. The following is the report for the multivariate analysis.

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NOISE ANALYSIS**

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EXECUTIVE SUMMARY

FINDINGS:

1. Ambient noise varies significantly between hours of the day as well as between sessions.
2. Ambient noise shows a periodicity during the 24-hour cycle.
3. The quietest times of the day show the greatest range of measure values. Some are at levels equal to those of the noisiest times of the day.
4. The noisiest times of the day show the smallest range of measure values.
5. There is large interday (day to day) variability in noise levels for four hour time blocks during plant operations. The L_{av} 95th percentile, derived from the distributions of these interday differences, ranges from 0.72 – 2.59. These values may be used to establish the significance threshold.
6. Selecting the significance threshold for determining post-project impacts depends upon the time block in question.
7. The Ambient Noise Statistical Multiple Regression Model reveals several findings:
 - 7.1. Environmental sources are highly statistically significant;
 - 7.2. The time of day has a significant impact on the noise level;
 - 7.3. Wave height is the most statistically significant variable; and
 - 7.4. Impact of the plant operations on ambient noise levels is much less pronounced. 78 % of the model fit is explained by non-plant sources.
8. The difference in noise levels at Ref 2 between the Unit 4 Operating and Shutdown phases is statistically not significant.

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1.0 INTRODUCTION

The following is an analysis of noise at the El Segundo Power Plant. A two-phase approach was taken in an attempt to comprehensively characterize the ambient noise at the site and assess the effect of site-specific factors on the noise. The analytic phases are described below.

1. Ambient Noise Variability Analysis

The purpose of this analysis is to characterize the natural ambient variability of the noise data and identify the potential contribution of the local environmental factors to the noise level. Understanding the natural variability in noise levels at the site, it is then possible to determine the significant threshold, which can then be used in assessing the significance of the post-project noise impacts.

2. Operational Analysis - Modeling of Noise Levels During Shutdown of Unit 4.

The purpose of this analysis is to model the contribution of Units 3 and 4 on the ambient noise. The question being explored is to what degree do these Units affect the ambient noise level. Is there a difference in noise levels that can be attributed to the operating status of Unit 4? The analysis also models the pre- and post-project conditions.

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2.0 DATA

2.1 Noise

Noise measurements were collected in five separate sessions. Sessions 1, 2, and 3 were used for the in the Natural Ambient Variability Analysis, and Sessions 4 and 5 were used for the Operational Analysis, which is the statistical modeling of noise levels during shutdown of Unit 4.

Sessions

Ambient Noise Variability Analysis

Session 1:	3:00 p.m., June 20 to 3:00 p.m., June 23
Session 2:	2:00 p.m. July 31 to 2:00 p.m., August 3
Session 3:	Noon, August 6 to Noon, August 9

Operational Analysis

Session 4:	Noon, August 10 to Noon, August 13
Session 5:	Noon, August 16 to Noon, August 19

Noise measurements for the five sessions were collected at 15 minute intervals. The measurements collected were the L_{av} , L_{50} , L_{90} and L_{max} . The measurement levels were converted to the hourly average, which is the base time unit for this analysis.

2.2 Wind

Wind data for the area was provided by the was provided National Oceanographic and Atmospheric Administration National Climatic Data Center meteorological station located at Los Angeles International Airport (LAX). The station, WBAN 23174, is an Expanded Automated Surface Observation system. It provides, among other variables, hourly wind data measured in knots. The data was converted to meters per second.

Based up the latitude and longitude of the station, it was determined that the station is approximately 12,000 ft (2.3 miles) from the El Segundo power plant. Therefore, it is possible to have reasonable confidence that the wind data collected is representative of that which would be collected at the site.

2.3 Wave

Wave data was provided by the Coastal Data Information Program Center For Coastal Studies. Data was collected from Scripps data buoy 02801. It is located 11 miles southwest of Santa Monica. Wave data was collected on the half-hour, and averaged to the hour.

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2.4 Tide

Tide data was provided by the National Oceanographic and Atmospheric Administration (NOAA), National Ocean Service, Center for Operational Oceanographic Products and Services (CO-OPS). Tide data was collected from NOAA data buoy 9410840. The tide gauge and staff are located on the offshore end of the Santa Monica pier. Tide data was collected every six minutes, and averaged to the hour for this analysis.

2.5 Operations

The El Segundo power plant staff provided operating data for Units 1 through 4. It was given in one-hour increments and based on the power output in megawatts for the respective units: 175 megawatts for Units One and Two, and 335 megawatts for Units Three and Four.

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3.0 AMBIENT NOISE VARIABILITY ANALYSIS

The purpose of this phase of the analysis is to characterize the natural ambient noise variability and identify the potential contribution of the local environmental factors to the noise levels. Three types of analyses are presented in this section: Exploratory Data Analyses, Interday Variability, and the use of Multivariate Regressions to model potential meteorological and plant operations influences on noise.

3.1 Exploratory Data Analysis

For this section, analysis was performed at several levels to explore and investigate the degree to which the measured noise varies between and within the three sampling sessions. The first analysis investigates the measured noise levels for the three sessions separately. Is there a difference, and if so how much? The second investigates how the noise levels vary by hours of the day. And the third analysis investigates whether it is possible to accurately reflect hourly trends in noise by aggregating it into smaller four-hour time blocks.

3.1.1 Session Noise

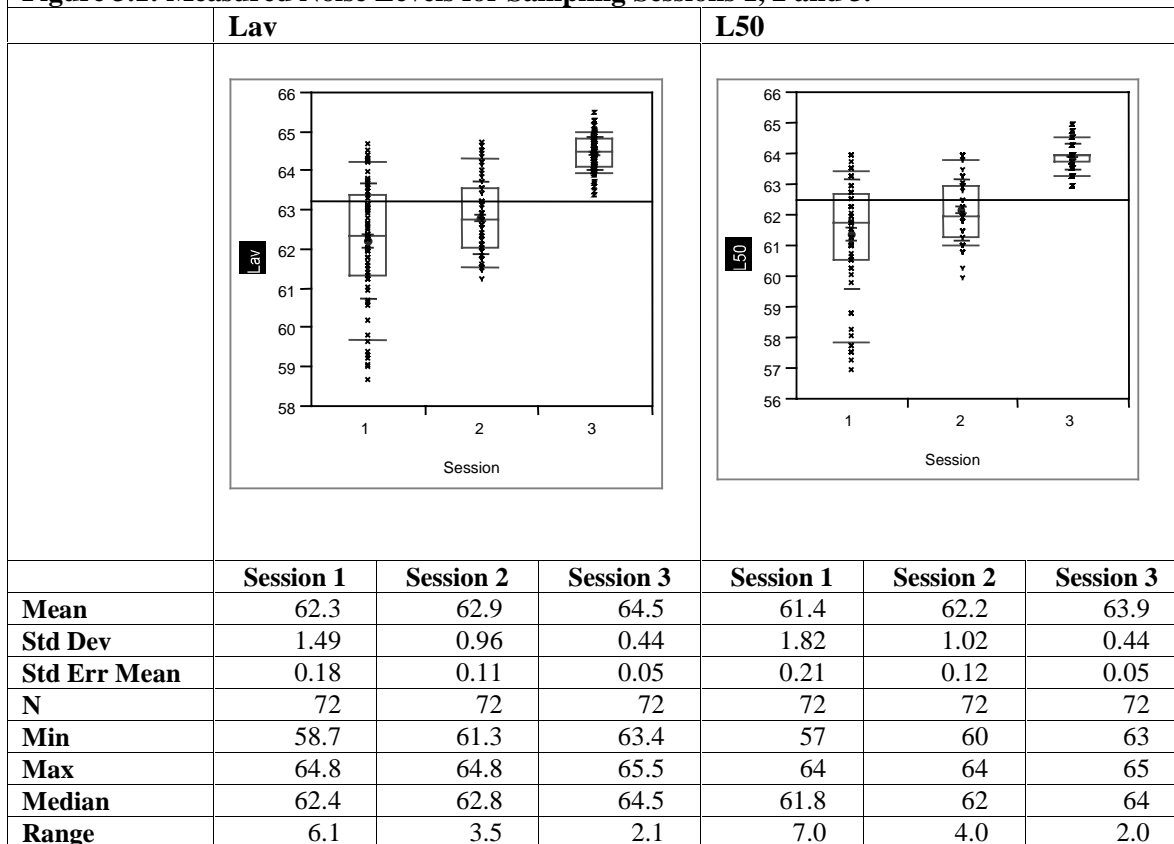
This analysis combines all the noise measurements for a given session and plots them as frequency distribution. To show how the three sessions compare, the plots have been aligned parallel to each to show how the noise levels for the three sessions correspond (see Figure 3.1).

Observations/Findings:

1. The three sampling sessions show a wide range of measured values in the ambient noise for L_{av} and L_{50} . Using the L_{50} , the measured values show a range 7 dBA for Session 1 versus 2 dBA for Session 3.
2. Session 3 was noisier, and the recorded noise levels occupied a narrower range than found with Sessions 1 and 2: a L_{av} of 2.1 dBA for Session 3 versus 6.1 and 3.5 dBA for Sessions 1 and 2, respectively. The L_{50} shows a similar trend.
3. One-way analysis of variance showed the difference in noise levels for the three sampling sessions to be statistically significant. The L_{av} differences between Sessions 1 and 3 was measured at 2.1 dBA.
4. The L_{50} showed a median value difference of 2.2 dBA between Sessions 1 and 3.

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Figure 3.1: Measured Noise Levels for Sampling Sessions 1, 2 and 3.



3.1.2 Hourly Levels For All Three Sessions

In this phase of the analysis, the measure noise values were recombined to explore how noise varied during hours of the day. To show this, new plots were created analogous to those created to show the data distributions for the three sessions. These plots grouped the data for all three sessions by hour of the day. Thus, for each hour there are nine data points, one for each of the nine days noise was measured. Time is represented using the 24-hour clock: 0 hour is midnight (Figure 3.2).

Observations/Findings:

1. There is an apparent periodicity with the measured noise levels over the 24-hour period. It is noisier late in the afternoon and quieter in the late night and early morning hours.
2. The daylight hours tend to be louder and show a relatively narrower range of recorded noise levels. The smallest range of measured values was collected in

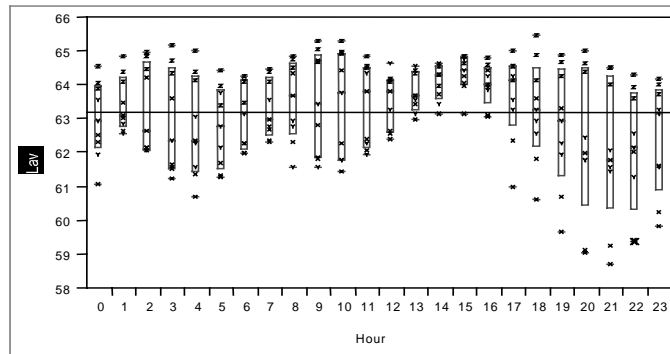
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the interval from 1:00 p.m. to 5:00 p.m. The 2:00 p.m. hour had the narrowest range of recorded values with a L_{av} of 1.51 dBA and L_{50} of 1.73 dBA.

3. It is quieter during the evening and early morning hours, but with a wider range of measured levels. This is most pronounced in the 9:00 p.m. to midnight period. For the 9:00 p.m. hour, the range of recorded values for L_{av} was 5.98 dBA. The range of measured L_{50} for the same hour was 7.0 dBA.
4. Some values recorded during this period were at the same level or louder than those found during the noisiest time of the day. The 3:00 a.m. hour had a L_{av} of 65.23 dBA and a L_{50} of 65.0 dBA. These measurements are larger than any recorded for the hours from 11:00 a.m. to 5:00 p.m.

Figure 3.2: Box Plots of the L_{av} and L_{50} Hourly Noise Measurements For All Three Sessions

L_{av}



L_{50}

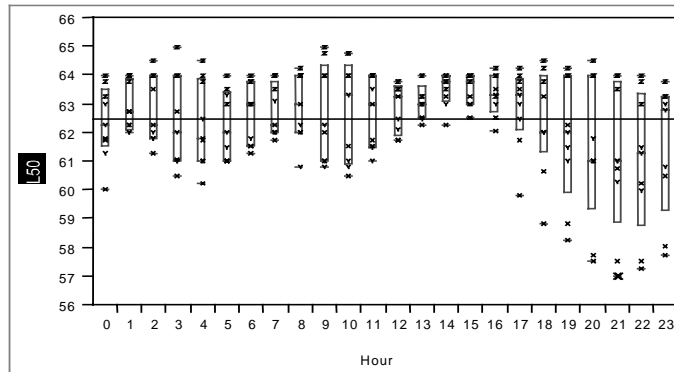


Figure 3.3 shows the session-specific hourly noise plots for L_{av} . These clearly show the degree of variation in the noise levels by hour for the separate sessions, as well as the

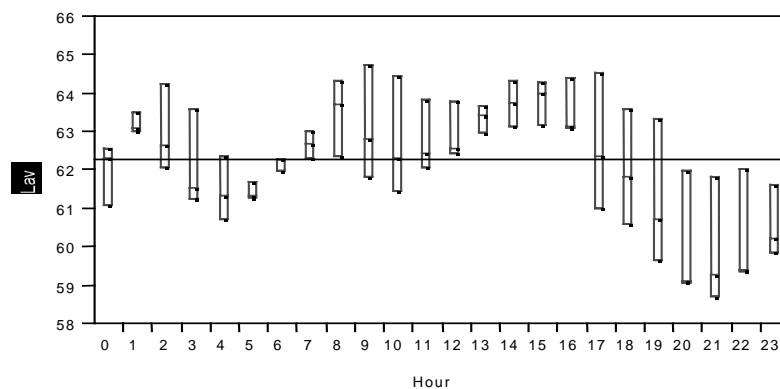
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difference in average noise levels. Similar plots for L_{50} are presented in Appendix A, Attachment 3.

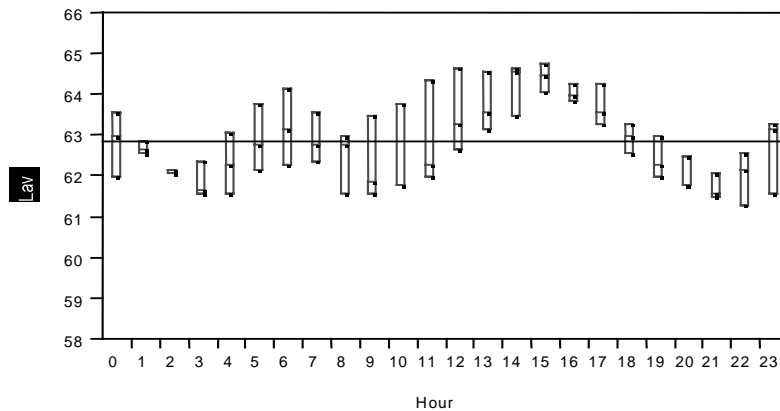
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Figure 3.3: Box Plots of the L_{av} Hourly Noise Measurements for the Three Individual Sampling Sessions

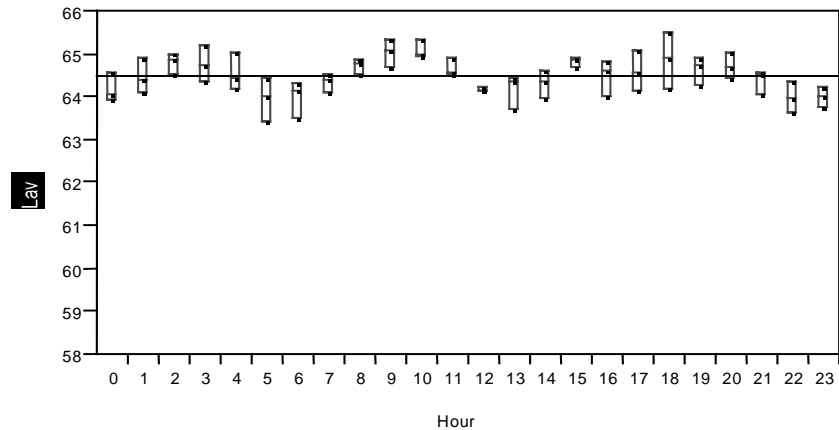
Session 1



Session 2



Session 3



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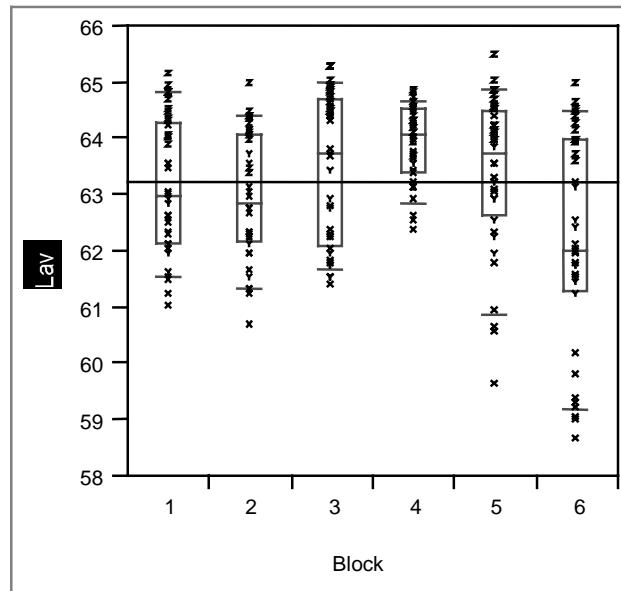
3.1.3 Hour Blocks Levels For All Three Sessions

In this portion of the analysis, the hour data were grouped into six four-hour blocks, similar to that discussed in the draft white paper as the base unit of measurement for comparison of the noise levels in the pre- and post-construction phase of the Power Plant upgrade. Again, as with the above analyses, the data represented with these plots is for the three recording sessions combined. For each block, there are 36 measurements.

Hour blocks:

Block 1	Midnight to 4:00 a.m.
Block 2	4:00 a.m. to 8:00 a.m.
Block 3	8:00 a.m. to Noon
Block 4	Noon to 4:00 p.m.
Block 5	4:00 p.m. to 8:00 p.m.
Block 6	8:00 p.m. to Midnight

Figure 3.4: Box Plots of the Lav Noise Measurements For All Three Sessions by Hour Blocks



	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Mean	63.2	63.01	63.50	63.97	63.45	62.21
Std Dev	1.20	1.13	1.33	0.68	1.4	1.88
Std Err Mean	0.20	0.19	1.33	0.38	1040	1.88
N	36	36	36	36	36	36
Min	61.11	60.74	61.48	62.46	59.69	58.74
Max	65.23	65.05	65.37	64.92	65.54	65.05
Median	63.03	62.91	63.77	64.13	63.77	61.35

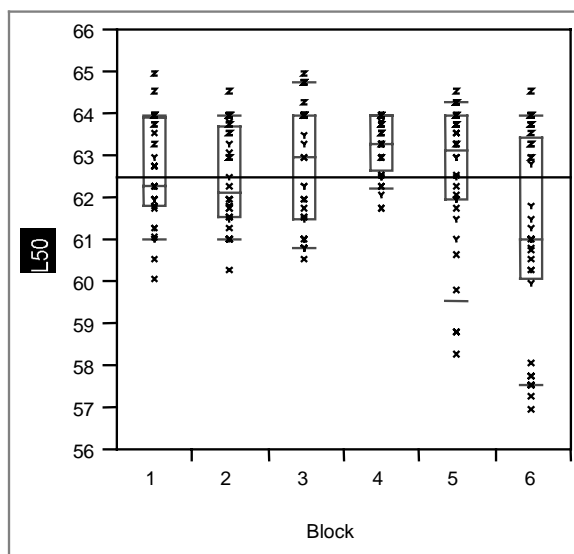
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Range	4.12	4.32	3.89	2.46	5.85	6.32
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Observations/Findings:

1. The apparent periodicity present in the hourly plot is still evident in the four-hour blocks. Block 6 (8:00 p.m. to Midnight) is quieter than the other blocks.
2. The blocks also do well in capturing the relative spread of data illustrated in the hourly plots, i.e., the noisier blocks show a narrower range of measured values and the quieter blocks show a wider range: an L_{av} of 2.46 dBA for Block 4 versus 6.32 dBA for Block 6.
3. A one-way analysis of variance shows that there are statistically significant differences in noise levels between three sets of blocks: Blocks 1, 2, 3, and 5; Block 4; and Block 6.

Figure 3.5: Box Plots of the L50 Noise Measurements For All Three Sessions by Hour Blocks



	Block 1	Block 2	Block 3	Block 4	Block 5	Block 6
Mean	62.60	62.48	62.78	63.25	62.59	61.21
Std Dev	1.24	1.17	1.44	0.24	1.66	2.38
Std Err Mean	0.21	0.19	0.24	0.12	0.28	0.40
N	36	36	36	36	36	36
Min	60.06	60.27	60.53	61.77	58.27	57.00
Max	65.00	64.53	65.00	64.00	64.53	64.53
Median	62.3	62.14	63.00	63.27	63.14	61.00
Range	4.94	4.26	4.47	2.23	6.26	7.53

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3.2 Interday Variability

This phase of the analysis explores the amount of interday variation in noise levels among the different hour blocks. The purpose of this phase is to quantify the degree to which the noise varies on a daily basis for these hour blocks, and to establish an estimate for the significance threshold. The significance threshold was defined as that change in noise level between the pre- and post-project states above which mitigation and re-survey would be required.

There are two statistics that can be used for determining the significance threshold: the 95% prediction limit and the 95th percentile. These statistics are useful because they effectively set the upper limit for the pre-project interday noise variability. These are the values above which, if a sample or samples were measured in the post-project state, some sort of mitigation action might be required.

The 95% prediction limit is a calculated value, which modifies the mean for a set of values based upon distribution for that sample. It is that value where there is only a 5% chance that a value measured in the future will exceed. It is dependent upon the degrees of freedom for the statistic in question, i.e. the sample size. Thus, if two sets of numbers have the same mean and similar distributions (standard deviations), but different sample sizes, the 95% prediction limit for the larger sample would be smaller than that of the smaller sample. The prediction limit for the smaller sample could even be larger than the largest measured value.

The other method for determining the significance threshold would be to take the value that represents the 95% percentile of the range of sampled data. At this point, only 5% of the measured data are greater than the value. Thus, as with the 95% prediction limit, the assumption is that with additional sampling under similar conditions, there is only a 5% chance of measuring noise above this value.

Because of concern with the small sample size found in Interday Groups 2 and 3, the decision was made to present the 95% percentile as the value for providing an estimate of the significance threshold. However, the 95% prediction limit was calculated and is also presented.

3.2.1 Method

To simplify the analysis, and to be consistent with the draft protocol described in draft white paper, the interday variability was calculated using the four-hour time blocks. The following steps were used to calculate the interday variability.

1. Calculated the average noise level (L_{av}) noise levels for the six four-hour time blocks for each day of the three sessions. From the original 216 hourly noise

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measurement, 54 block averages were calculated, 18 blocks per session, six blocks per day.¹

2. Took the difference between the identical time blocks for the different days of each session. Thus, for each three-day session, there are two values representing the difference between the noise levels of the same time blocks. From the original 18 block averages available in each session, 12 interday differences were calculated, two per block. This resulted in a total of 36 interday differences.
3. The calculated differences were regrouped into the three new blocks based upon the ANOVA results.
4. Exploratory Data Analysis was performed and Descriptive Statistics were calculated.

Analysis Groups:

Interday Group 1	Midnight to Noon and 4:00 p.m. to 8:00 p.m. (original Hour Blocks 1, 2, 3, and 5)
Interday Group 2	Noon to 4:00 p.m. (original Hour Block 4)
Interday Group 3	8:00 p.m. to Midnight (original Hour Block 6)

3.2.2 Observations/Findings

1. The average L_{av} interday difference for the three groups is not significantly different.
2. Group 2, the time block from noon to four, shows the narrowest interday variation. It is also the noisiest time of the day.
3. Group 3, the time block for 8:00 p.m. to midnight, shows the largest interday variation with a range of 2.78 dBA. Interestingly, it is also the block with the lowest average noise.
4. The 95th percentile, derived from the distributions of these interday differences, ranges from 0.72 – 2.59 for L_{av} and 0.93 to 2.73 dBA for the L_{50} .

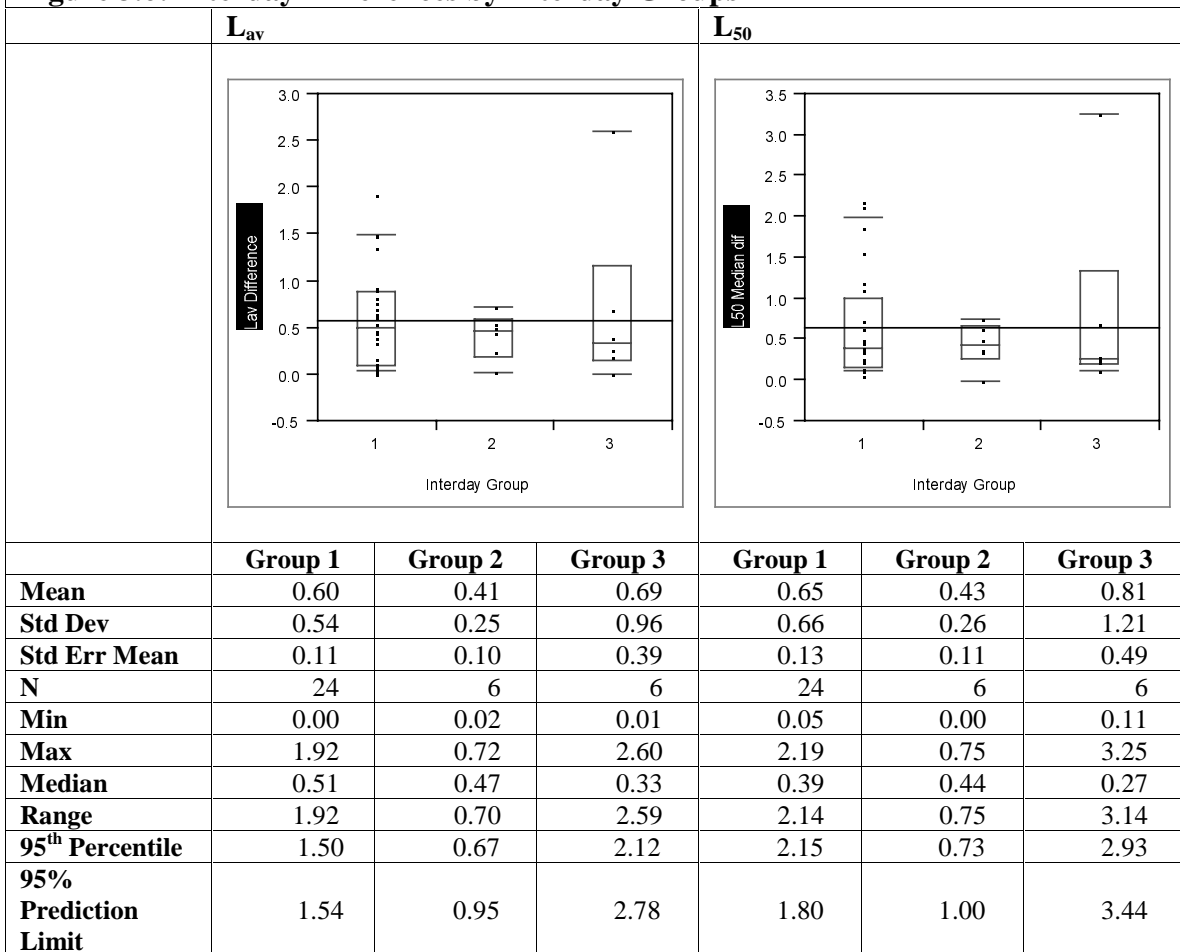
¹ For the L_{50} differences, the same steps were followed with the following exception. Instead of taking the difference between the mean value, the median difference value was calculated for the four hour L_{50} time blocks.

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3.2.3 Significance Threshold

The analysis shows that selecting the value to be used as the significance threshold is dependent upon the time of day. Any of the three interday group 95th percentile values can be used. However, the values should be interpreted cautiously. It would appear that selecting the 95th percentile value of Interday Group 3 as the significance threshold would provide the most conservative estimate for determining the post-project impact on noise. Thus, post-project noise would have to increase by more than 2.12 dBA using the L_{av} value (or 2.93 dBA using the L_{50} value) during the hours of 8:00 p.m. to midnight before the impact would be considered to be sufficient to require some sort of mitigation. However, it is possible that a change in noise levels of more than 0.67 dBA for L_{av} (0.73 dBA for L_{50}) during the noon to 4:00 p.m. hours of Interday Group could actually be a more significant impact.

Figure 3.6: Interday Differences by Interday Groups



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3.3 Modeling Ambient Variability

A multiple regression was performed to explore whether there is a statistically significant relationship among the environmental variables in question (wind, tide, and wave height), time of day, and plant operation and the measured noise levels. The question being explored is whether it is statistically possible to predict the measured noise knowing the environmental and plant operational factors and if so, to what degree.

3.3.1 Building the Model

The dependent or response variable for the model was the L_{av} . The independent or regressor variables were of three types: environmental, operational, and time. The environmental variables were tide height (meters), wave height (meters), and wind speed (meters/second). Operational variables consisted of the power output of the plant. This was given in megawatts. Time was represented using dummy variables which reflected the four-hour time blocks first discussed in Section 3.1.3. This was done to investigate the influence time might have on noise².

Forward stepwise regression was used to select which of the environmental, operational, and time variables to include. A significance probability of 0.25 was used for variable inclusion. Once variables were selected, the Standard Least Squares Model was used to fit the data.

3.3.2 Results

All variables were included in the model at the 0.25 probability. The environmental, operational, and time variables and time all show a statistically significant relationship with noise. Statistics for the model are given in Tables 3.1 and 3.2.

1. Environmental factors are highly statistically significant as shown by the R square value of 0.67. This means that approximately 67% of variability of effects are due to the environmental factors as provided by this model.
2. The time of day has a significant impact on the noise level. This is shown by the fact that the standardized beta coefficient³ is in the range of 0.35 to 0.43 for Hour Blocks 3, 4, and 5 (8:00 a.m. to 8:00 p.m.). See Figure 3.7.

² Time can also be considered a surrogate measure of all other activities that which produce noise, but not explicitly measured. It includes all the activities of normal daily life.

³ The standardized beta coefficient helps assess the relative importance of the independent variables relative to the given model embodied in the regression equation. The larger the coefficient, the more importance the variable is to the model.

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3. Of the environmental variables, wave height is the most statistically significant variable. This, again, can be best visually illustrated by the standardized beta coefficient.
4. Impact of the plant operations is much less pronounced. It is not possible to attribute activity of plant as a major contributor to the noise level.

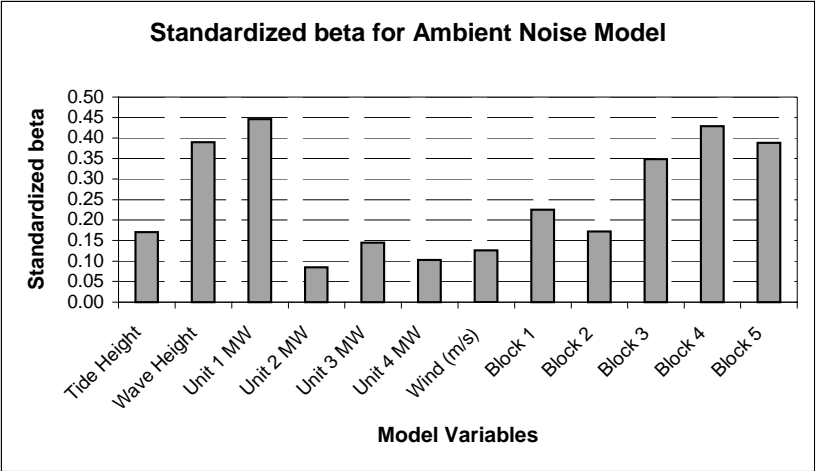
If the power plant operations data is not included in the model, the model still yields a highly significant R Square of 0.52. Which means that 78% of the ambient noise model fit is explained by non-plant sources. This further supports the finding that environmental variables are significant factors their relationship with the ambient noise. Statistics for this model are found in Appendix A, Attachment 7.

Table 3.1: Summary of Fit for the Ambient Noise Model	
RSquare	0.67
RSquare Adj	0.66
Root Mean Square Error	0.83
Mean of Response	63.22
Observations (or Sum Wgts)	216.00

Table 3.2: Ambient Noise Model Parameter Estimates					
Term	Estimate	Std Error	t Ratio	Prob> t 	Std Beta
Intercept	59.72	0.5152	115.92	<.0001	0.00
Tide Height	-0.43	0.1550	-2.74	0.0066	-0.17
Wave Height	3.49	0.4308	8.11	<.0001	0.39
Unit 1 MW	-0.03	0.0033	-9.40	<.0001	-0.45
Unit 2 MW	0.01	0.0049	2.01	0.0456	0.08
Unit 3 MW	0.00	0.0018	1.23	0.2197	0.14
Unit 4 MW	0.00	0.0017	0.98	0.3285	0.10
Wind (m/s)	-0.10	0.0599	-1.69	0.0929	-0.13
Block 1	-0.43	0.1509	-2.82	0.0053	-0.23
Block 2	-0.33	0.1697	-1.92	0.0566	-0.17
Block 3	-0.66	0.1261	-5.23	<.0001	-0.35
Block 4	-0.81	0.1302	-6.22	<.0001	-0.43
Block 5	-0.73	0.1131	-6.50	<.0001	-0.39

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Figure 3.7: Standardized Beta Weights for the Ambient Noise Model



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4.0 OPERATIONAL ANALYSIS

This analysis investigates whether there is a statistically significant relationship between the plant operations and the noise levels as measured at Ref 2. The question being explored in this phase has to do with the effect of Unit 4's operation on the measured noise levels at Ref 2. The Analysis of Covariance with block design was employed for this phase of the analysis.

The Analysis of Covariance design is a pre-test/post-test experimental design. The analysis assumes that the data between two groups are well described by straight lines that have the same slope, the only difference being the test. The analysis functions by controlling all the independent variables (covariates) with the exception of the factor in question. With all independent variables controlled, if the analysis shows a difference, it is due to the effect of the test under investigation. In this instance, the test being investigated is the effect of Unit 4, operating or shutdown, on the noise levels at Ref 2. All the other variables are controlled.

The analysis also allows us to model the pre- and post-project states. As indicated, the model developed tests the difference in noise levels between the time when Unit 4 is operating and when it is shutdown. Ref 2, because of its placement closer to Unit 4 and not shielded by the tanks, can be used as to model the potential impact on noise levels between the pre- and post-project states.

The pre-project state is represented by the Unit 4 shutdown phase. By using only the noise levels measured during the shutdown of Unit 4, it provides a conservative estimate of the noise levels one might expect find in the pre-project states. The post-project state is represented by the Unit 4 Operation phase. The conditions in this phase are most similar to those that would be found in the post-project phase: Unit 4 operating and no shielding from the tank.

Using the noise level measurements from Ref 2 provides the most conservative modeling of the pre-project conditions. The monitoring site is closer to the unit and no has shielding of plant noise by the tanks. Thus, noise levels measured during shutdown are assumed to be equal to than those found at the fence line during pre-project conditions. Conversely, noise levels measured during operations are assumed to be higher than those found at the fence line during normal conditions in post-project state.

Being thus defined, the model provides a reasonable estimate of what to expect in the post-project timeframe. If, for example, the model shows that Unit 4 makes a statistically significant contribution to the noise levels at Ref 2, it could indicate that some sort of measures might be necessary to mitigate that impact. If, on the other hand, the analysis shows no statistical difference at Ref 2, it suggests that the impact of plant noise would be even less at the fence line, which is located further from the source. No additional mitigation measures would be necessary.

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4.1 Building the Model

The dependent or response variable for the model was the L_{av} . The independent or regressor variables were of three types: environmental, operational, and time. The environmental variables were tide height (meters), wave height (meters), and wind speed (meter/second). Operational variables consisted of the power output of the plant for Unit 3, given in megawatts. Time was represented using dummy variables, which reflected the four-hour time blocks first discussed in Section 3.1.3. This was done to investigate the influence time might have on noise.

Unit 4 was represented as a dummy variable with a value of one or zero, operating or shutdown. Operating is defined as consisting of one of three phases: power up, operation, and shutdown. The power up phase which encompassed the sequence of events necessary to prepare the unit for power production. The operation phase is that period of time when the unit produces power. And finally, the shutdown phase represents the sequence of events necessary to terminate the power production activities and prepare the unit for service.

Forward stepwise regression was used to select which of the environmental, operational and time variables to include. A probability of 0.25 was used for variable inclusion. Once variables were selected, the Standard Least Squares Model was used to fit the data.

4.2 Exploratory Data Analysis

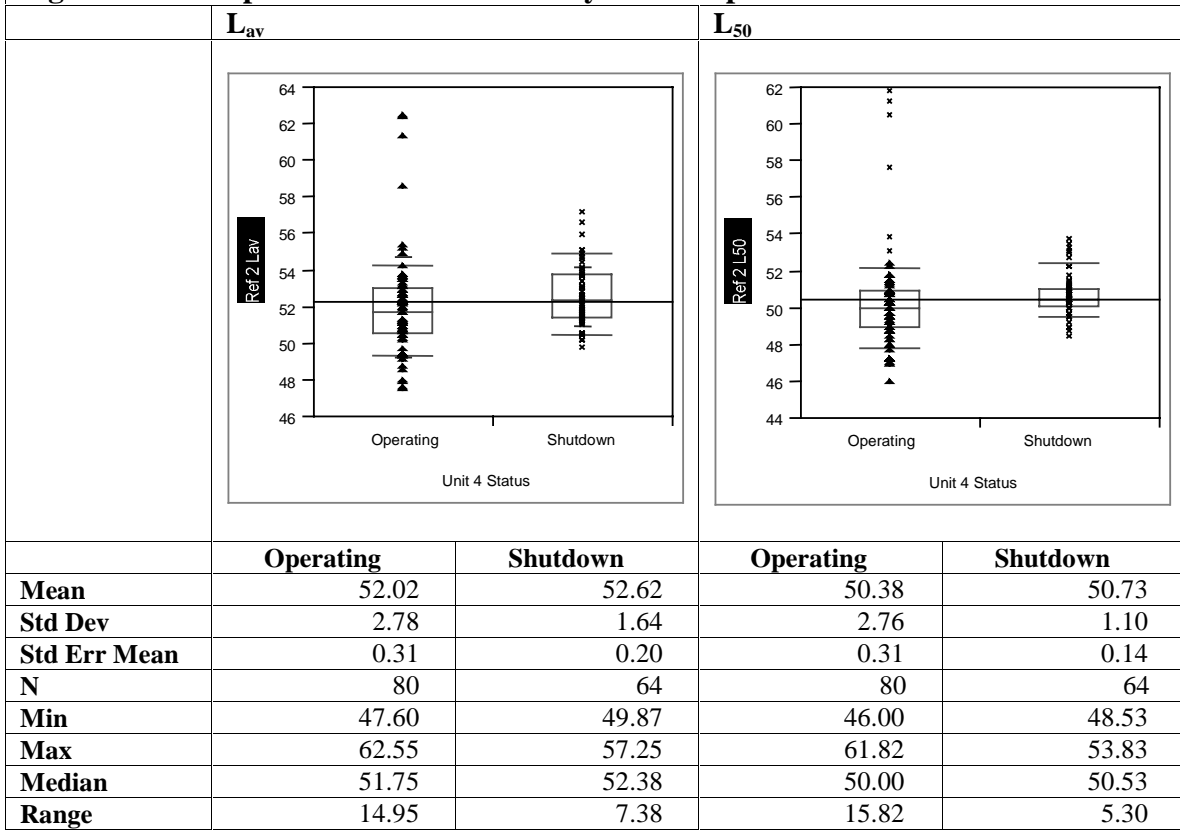
This analysis combines all the noise measurements for Sessions 4 and 5 and plots them as frequency distribution. To show how the operational states compare, the plots have been aligned parallel to each to show how the noise levels for the two operational states correspond (Figure 4.1).

Observations/Findings:

1. The difference between the two phases is not statistically significant.
2. The range of L_{av} values was broader for the operating phase than for the shutdown phase – 14.98 dBA versus 7.38 dBA, respectively.
3. The range of L_{50} values showed a similar distribution with the operating phase being broader than the shutdown phase: 15.82 dBA versus 5.3 dBA, respectively.
4. The mean L_{avs} for the different states are only different by 0.60 dBA, 52.02 for the Operating phase and 52.62 for the Shutdown phase. The L_{50} shows the similar trend.

EL SEGUNDO POWER REDEVELOPMENT PROJECT (ESPRP) NOISE ANALYSIS

Figure 4.1: Comparison of Noise Levels by Unit 4 Operational Status



4.3 Model Results

In contrast to the ambient noise model, variable selection for this model was limited to the environmental variables and a few time blocks. Unit 3 did not exhibit a statistically significant relationship with the measured noise at Ref 2.

1. Environmental factors are highly statistically significant. This is shown by the R square value of 0.27.
2. The effect of Unit 4 is small compared to the environmental and time factors. It has the smallest standardized beta coefficient. This suggests that plant operation, Unit 4, does not have a significant impact on the noise levels.
3. The time of day has a significant impact on the noise level. Noise levels do vary as a function of the time of day. This is evidenced by the inclusion of the hour blocks in the model. This is shown by the fact that the standardized beta coefficient is in the range of 0.21 to 0.40 for Hour Blocks 2, 3, 4 and 5 (4:00 a.m. to 8:00 p.m.). See Figure 4.2.

EL SEGUNDO POWER REDEVELOPMENT PROJECT (ESRP) NOISE ANALYSIS

4. Of the environmental variables, wave height is the most statistically significant variable. This again can be best visually illustrated by the standardized beta coefficient.

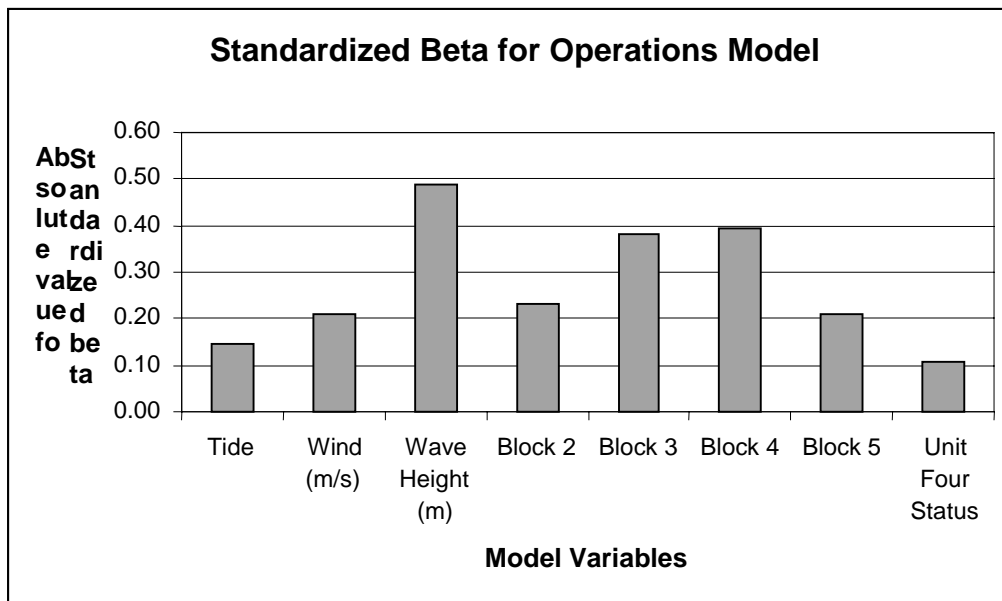
The analysis results suggest that the post-project impact the Unit 4 operations on the noise level would be not statistically different from those found in the pre-project state. Ref 2, which is closer to Unit 4 than the fence line and lacks the shielding of the tanks in question, provides a conservative model of the post-project conditions. Even at this close location, the effect of Unit 4 is small compared to the environmental and time factors as indicated by the standardized beta coefficient. Further away, the impact of Unit 4 should be expected to be smaller. Thus, it is possible to suggest that the post-project noise levels should not be statistically different from those found in the pre-project state.

Table 4.1: Summary of Fit for the Operations Model	
Rsquare	0.27
RSquare Adj	0.22
Root Mean Square Error	2.07
Mean of Response	52.28
Observations (or Sum Wgts)	144.00

Table 4.2: Operations Model Parameter Estimates					
Term	Estimate	Std Error	t Ratio	Prob> t 	Std Beta
Intercept	47.80	1.52	31.51	<.0001	0.00
Tide	-0.73	0.42	-1.71	0.0896	-0.14
Wind (m/s)	0.22	0.15	1.47	0.1428	0.21
Wave Height (m)	7.36	1.40	5.25	<.0001	0.49
Block 2	-0.72	0.27	-2.72	0.0074	-0.23
Block 3	-1.20	0.31	-3.89	0.0002	-0.38
Block 4	-1.24	0.43	-2.89	0.0045	-0.40
Block 5	-0.66	0.41	-1.61	0.1098	-0.21
Unit Four Status	-0.25	0.20	-1.28	0.2022	-0.11

**EL SEGUNDO POWER REDEVELOPMENT PROJECT (ESRP)
NOISE ANALYSIS**

Figure 4.2: Standardized Beta Weights for the Operations Model



APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 1. SUMMARY STATISTICS

ATTACHMENT 2. TIME PLOTS

ATTACHMENT 3. SESSION SPECIFIC L50 HOURLY BOX PLOTS

ATTACHMENT 4. VARIABILITY ANALYSIS ANOVAs

ATTACHMENT 5. INTERDAY DIFFERENCES

ATTACHMENT 6. CORRELATION MATRIX

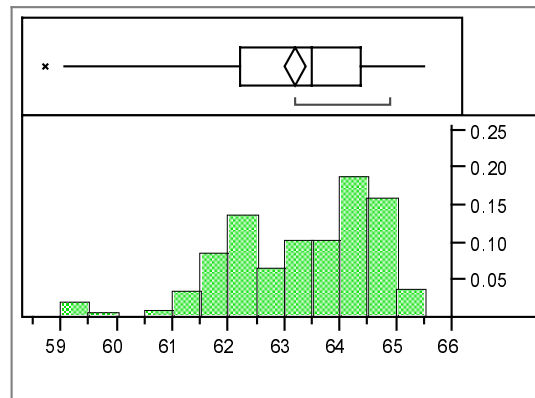
ATTACHMENT 7. AMBIENT NOISE MODELS

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 1. SUMMARY STATISTICS

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Summary Statistics for Lav (dBA)

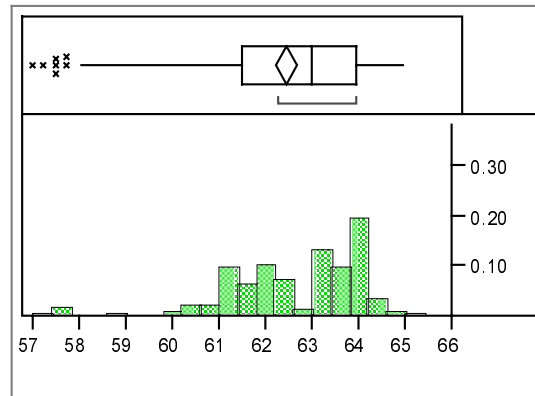


Quantiles		
maximum	100.0%	65.54
	99.5%	65.52
	97.5%	65.09
	90.0%	64.80
	75.0%	64.40
quartile	50.0%	63.50
quartile	25.0%	62.23
	10.0%	61.53
	2.5%	59.40
	0.5%	58.77
minimum	0.0%	58.74

Moments	
Mean	63.22
Std Dev	1.41
Std Error Mean	0.10
Upper 95% Mean	63.41
Lower 95% Mean	63.04
N	216.00
Sum Weights	216.00
Sum	13656.48
Variance	1.99
Skewness	-0.79
Kurtosis	0.31
CV	2.23

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 2: Summary Statistics for L50 (dBA)

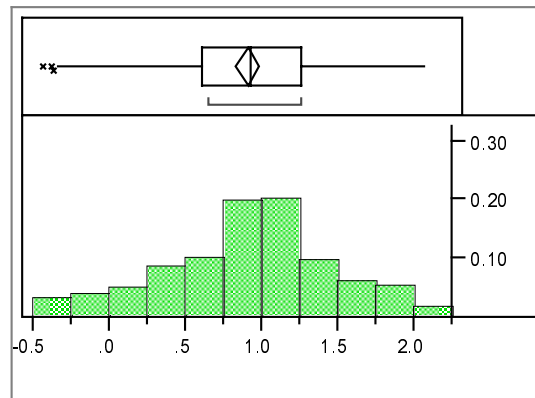


Quantiles		
maximum	100.0%	65.00
	99.5%	65.00
	97.5%	64.67
	90.0%	64.00
	75.0%	64.00
quartile	50.0%	63.00
quartile	25.0%	61.53
	10.0%	60.73
	2.5%	57.63
	0.5%	57.02
minimum	0.0%	57.00

Moments	
Mean	62.49
Std Dev	1.63
Std Error Mean	0.11
Upper 95% Mean	62.71
Lower 95% Mean	62.27
N	216.00
Sum Weights	216.00
Sum	13497.48
Variance	2.64
Skewness	-1.13
Kurtosis	1.38
CV	2.60

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 3: Summary Statistics for Tide Height (meters)

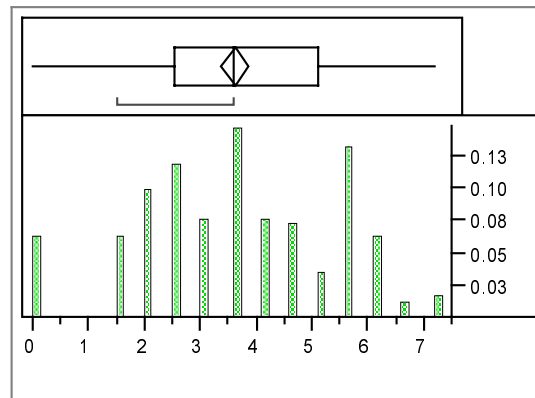


Quantiles		
maximum	100.0%	2.08
	99.5%	2.07
	97.5%	1.99
	90.0%	1.68
	75.0%	1.27
quartile	50.0%	0.94
quartile	25.0%	0.62
	10.0%	0.05
	2.5%	-0.31
	0.5%	-0.42
minimum	0.0%	-0.42

Moments	
Mean	0.92
Std Dev	0.57
Std Error Mean	0.04
Upper 95% Mean	0.99
Lower 95% Mean	0.84
N	216.00
Sum Weights	216.00
Sum	198.02
Variance	0.32
Skewness	-0.25
Kurtosis	-0.31
CV	61.95

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 4: Summary Statistics for Wind Speed (meters/sec)

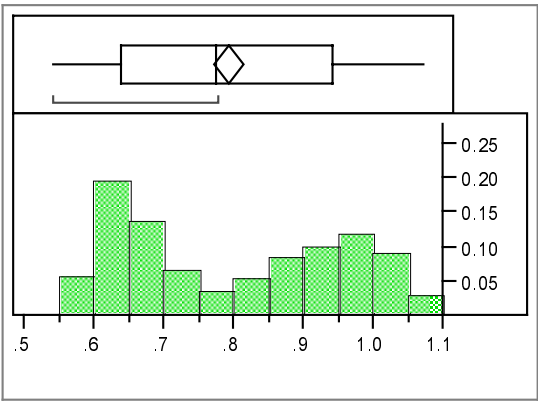


Quantiles		
maximum	100.0%	7.21
	99.5%	7.21
	97.5%	6.69
	90.0%	5.82
quartile	75.0%	5.15
median	50.0%	3.60
quartile	25.0%	2.57
	10.0%	1.54
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00

Moments	
Mean	3.64
Std Dev	1.76
Std Error Mean	0.12
Upper 95% Mean	3.88
Lower 95% Mean	3.41
N	216.00
Sum Weights	216.00
Sum	786.60
Variance	3.08
Skewness	-0.13
Kurtosis	-0.56
CV	48.19

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 5: Summary Statistics for Wave Height (meters)

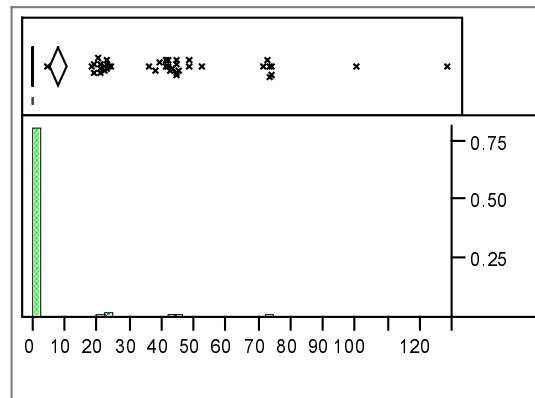


Quantiles		
maximum	100.0%	1.08
	99.5%	1.07
	97.5%	1.06
	90.0%	1.02
quartile	75.0%	0.94
median	50.0%	0.78
quartile	25.0%	0.64
	10.0%	0.61
	2.5%	0.57
	0.5%	0.55
minimum	0.0%	0.55

Moments		
Mean		0.79
Std Dev		0.16
Std Error Mean		0.01
Upper 95% Mean		0.82
Lower 95% Mean		0.77
N		216.00
Sum Weights		216.00
Sum		171.70
Variance		0.02
Skewness		0.17
Kurtosis		-1.45
CV		19.81

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 6: Summary Statistics for Unit 1 Power (megawatts)

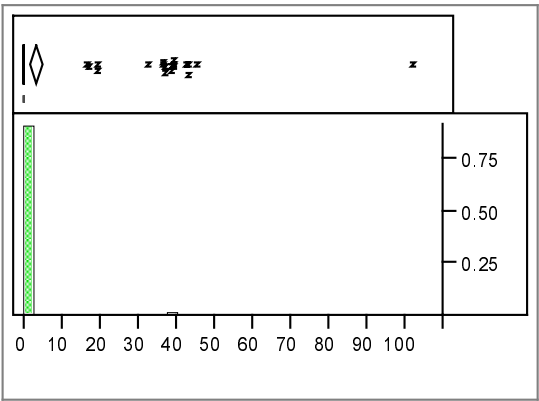


Quantiles		
maximum	100.0%	128.84
	99.5%	126.44
	97.5%	73.84
	90.0%	41.67
	75.0%	0.00
quartile	50.0%	0.00
quartile	25.0%	0.00
minimum	10.0%	0.00
	2.5%	0.00
	0.5%	0.00
	0.0%	0.00

Moments	
Mean	8.20
Std Dev	20.04
Std Error Mean	1.36
Upper 95% Mean	10.89
Lower 95% Mean	5.51
N	216.00
Sum Weights	216.00
Sum	1771.36
Variance	401.52
Skewness	2.92
Kurtosis	9.63
CV	244.34

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

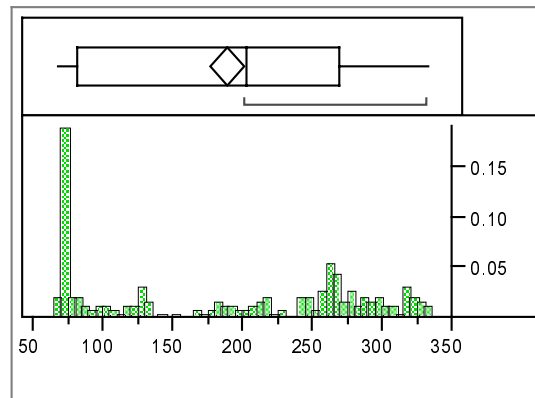
Figure 7: Summary Statistics for Unit 2 Power (megawatts)



Quantiles		
maximum	100.0%	102.47
	99.5%	97.65
	97.5%	41.76
	90.0%	0.00
	75.0%	0.00
quartile	50.0%	0.00
median	25.0%	0.00
quartile	10.0%	0.00
	2.5%	0.00
	0.5%	0.00
	0.0%	0.00
minimum		
Moments		
Mean		3.39
Std Dev		12.12
Std Error Mean		0.82
Upper 95% Mean		5.01
Lower 95% Mean		1.76
N		216.00
Sum Weights		216.00
Sum		731.74
Variance		146.88
Skewness		4.39
Kurtosis		24.03
CV		357.75

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 8: Summary Statistics for Unit 3 Power (megawatts)

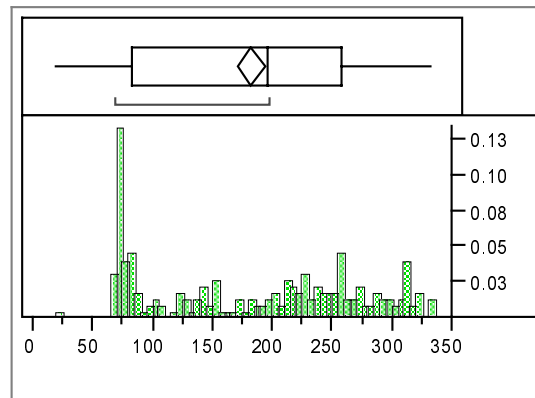


Quantiles		
maximum	100.0%	333.65
	99.5%	333.51
	97.5%	326.51
	90.0%	309.22
	75.0%	269.88
quartile	50.0%	204.45
quartile	25.0%	82.19
	10.0%	71.56
	2.5%	70.01
	0.5%	68.91
minimum	0.0%	68.90

Moments	
Mean	189.72
Std Dev	92.47
Std Error Mean	6.29
Upper 95% Mean	202.12
Lower 95% Mean	177.32
N	216.00
Sum Weights	216.00
Sum	40979.02
Variance	8550.58
Skewness	-0.06
Kurtosis	-1.58
CV	48.74

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 9: Summary Statistics for Unit 4 Power (megawatts)



Quantiles		
maximum	100.0%	333.58
	99.5%	333.56
	97.5%	321.51
	90.0%	303.75
	75.0%	258.71
quartile	50.0%	197.54
quartile	25.0%	84.39
	10.0%	71.46
	2.5%	69.82
	0.5%	24.25
minimum	0.0%	20.06
Moments		
Mean		183.43
Std Dev		87.07
Std Error Mean		5.92
Upper 95% Mean		195.11
Lower 95% Mean		171.75
N		216.00
Sum Weights		216.00
Sum		39621.02
Variance		7580.86
Skewness		0.01
Kurtosis		-1.40
CV		47.47

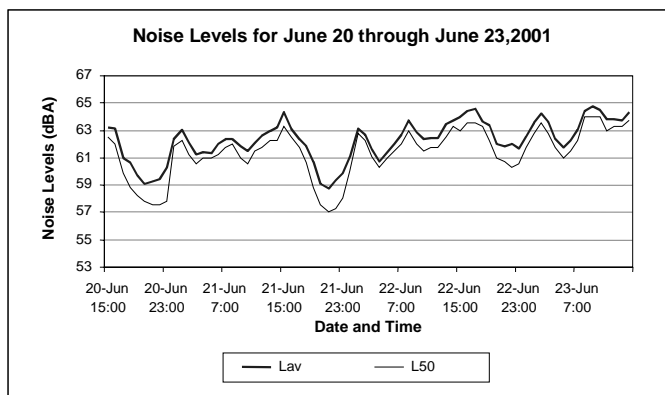
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 2. TIME PLOTS (BY SESSION)

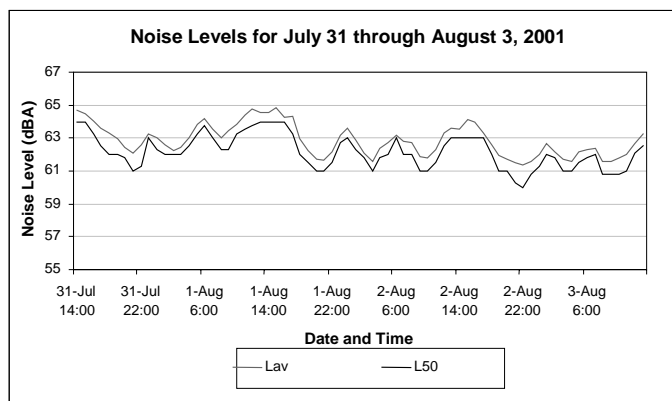
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Individual Session Time Plots for Noise

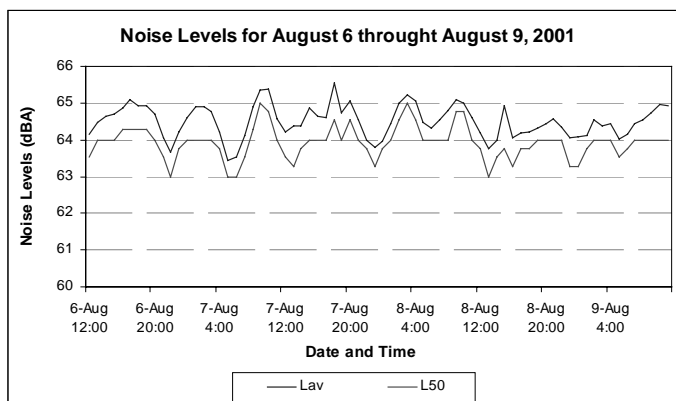
Session 1



Session 2



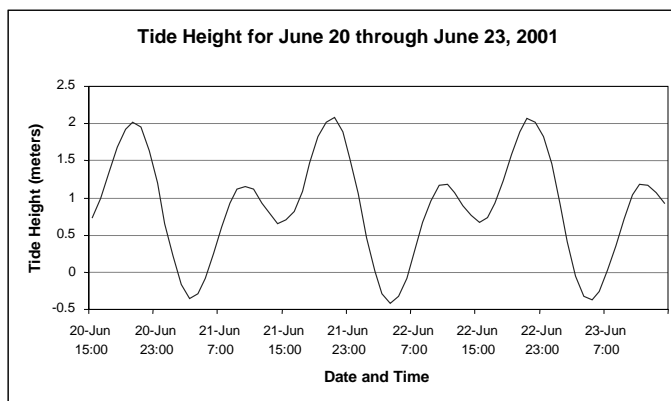
Session 3



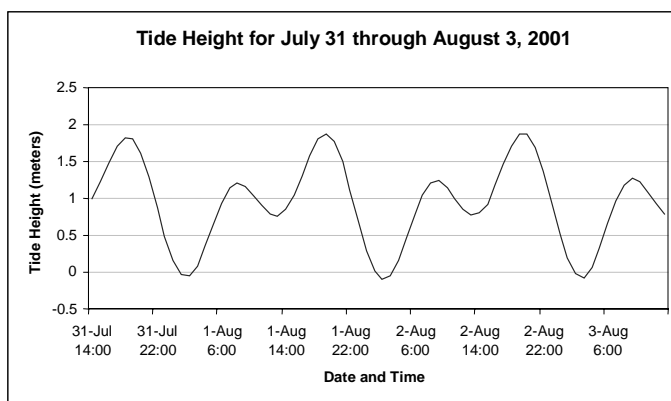
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 2: Individual Session Time Plots for Tide Height (meters)

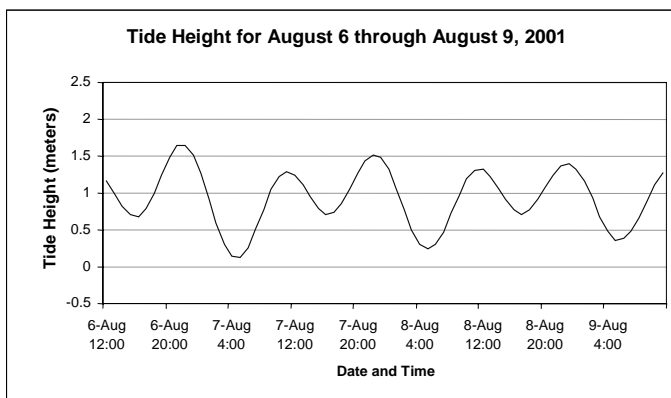
Session 1



Session 2



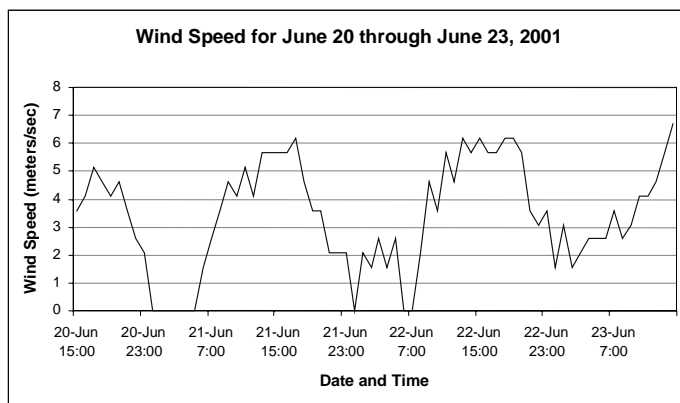
Session 3



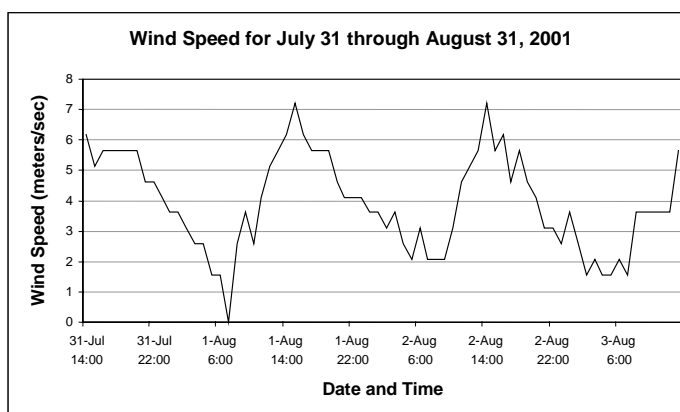
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 3: Individual Session Time Plots for Wind Speed (Meters/Sec)

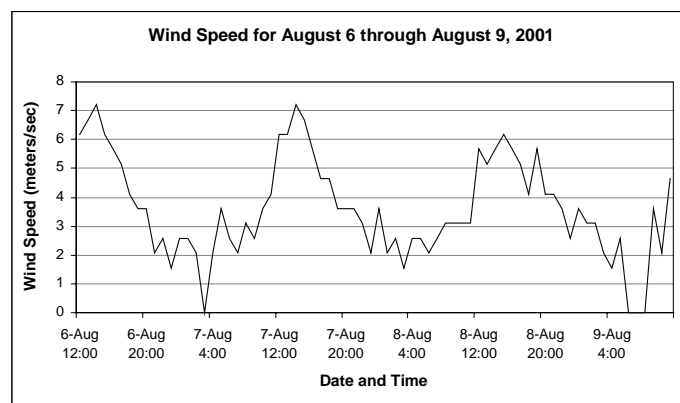
Session 1



Session 2



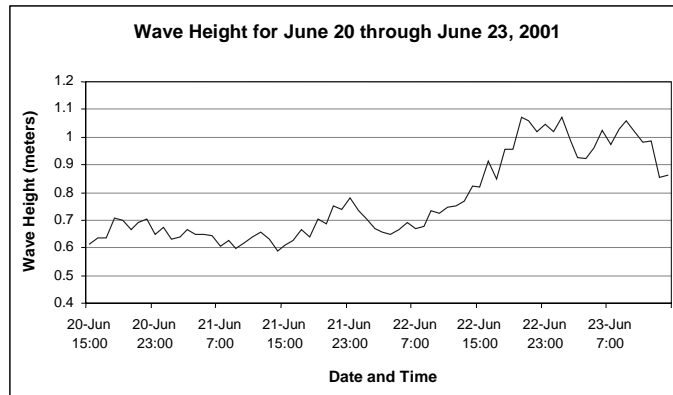
Session 3



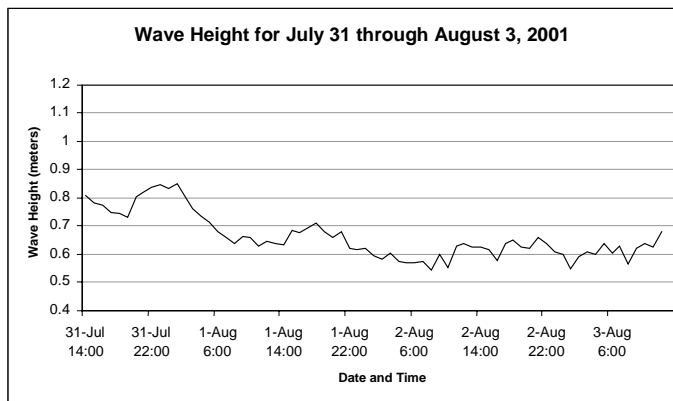
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 4: Individual Session Time Plots for Wave Height (meters)

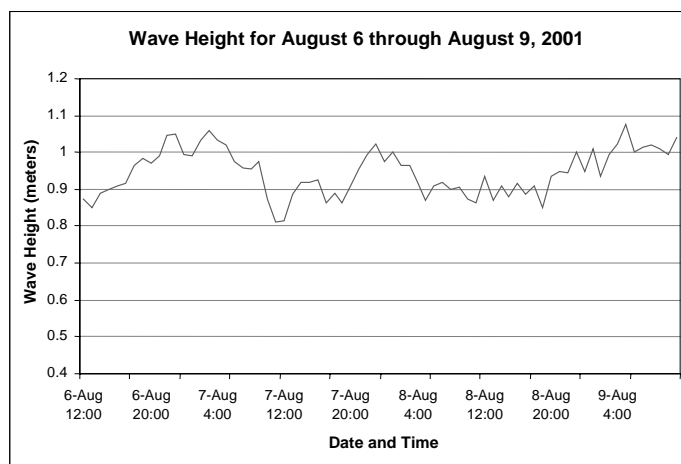
Session 1



Session 2



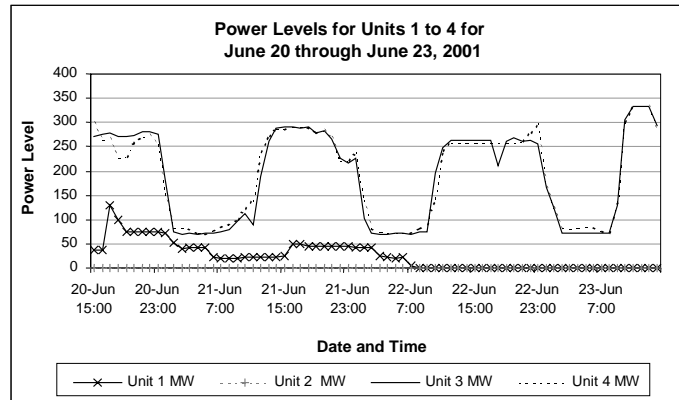
Session 3



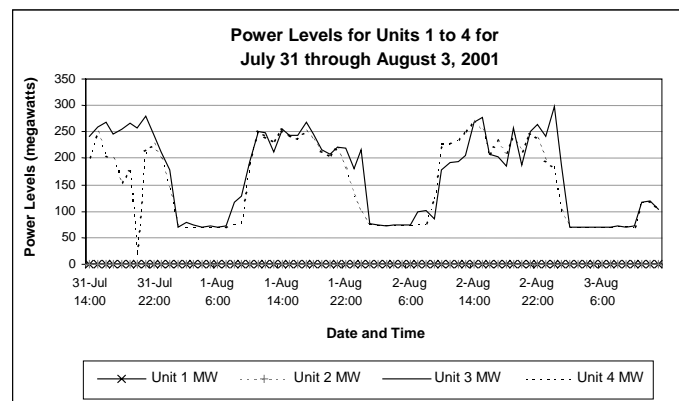
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 5: Individual Session Time Plots for Power Levels (Megawatts)

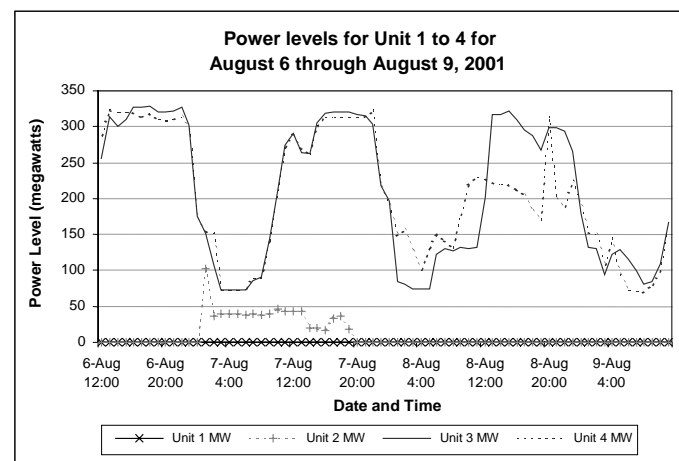
Session 1



Session 2



Session 3



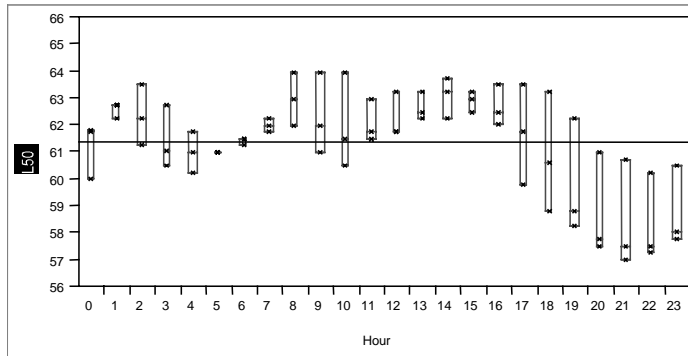
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 3. SESSION SPECIFIC L50 HOURLY BOX PLOTS

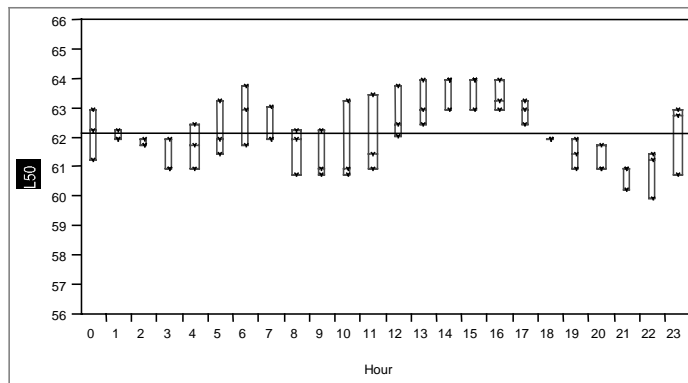
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Box Plots for the L50 Hourly Noise Measurements for the Three Individual Sampling Sessions

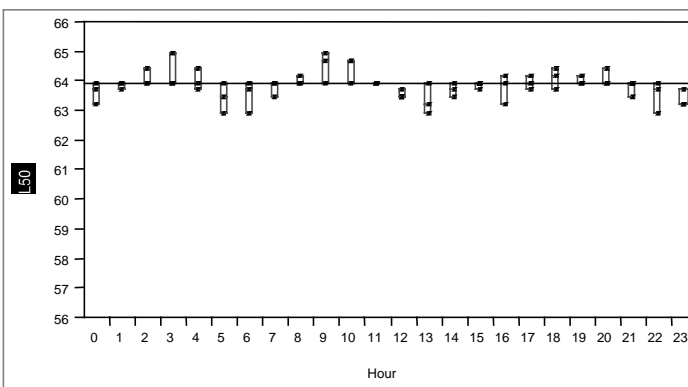
Session 1



Session 2



Session 3

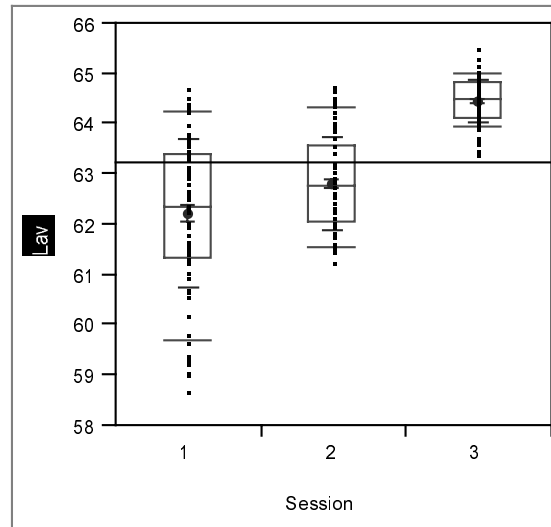


APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 4. VARIABILITY ANALYSIS ANOVAS

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Individual Session ANOVA for Lav



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	58.73784	59.74166	61.40281	62.38457	63.43521	64.30084	64.77753
2	61.3	61.6	62.1	62.8	63.6	64.37	64.8
3	63.45029	63.9866	64.17738	64.52985	64.8951	65.05449	65.5376

Oneway Anova Summary of Fit

RSquare	0.445725
RSquare Adj	0.440521
Root Mean Square Error	1.056243
Mean of Response	63.22445
Observations (or Sum Wgts)	216

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	191.09508	95.5475	85.6429
Error	213	237.63349	1.1157	Prob>F
C Total	215	428.72857	1.9941	<.0001

Means for Oneway Anova

Level	Number	Mean	Std Error
1	72	62.2856	0.12448
2	72	62.8778	0.12448
3	72	64.5100	0.12448

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean
1	72	62.2856	1.49397	0.17607
2	72	62.8778	0.95891	0.11301
3	72	64.5100	0.44216	0.05211

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means Comparisons			
Dif=Mean[i]-Mean[j]	3	2	1
3	0.00000	1.63218	2.22433
2	-1.63218	0.00000	0.59215
1	-2.22433	-0.59215	0.00000

Alpha= 0.05
 Comparisons for each pair using Student's t
 t 1.97119

Abs(Dif)-LSD	3	2	1
3	-0.34701	1.28517	1.87732
2	1.28517	-0.34701	0.24514
1	1.87732	0.24514	-0.34701

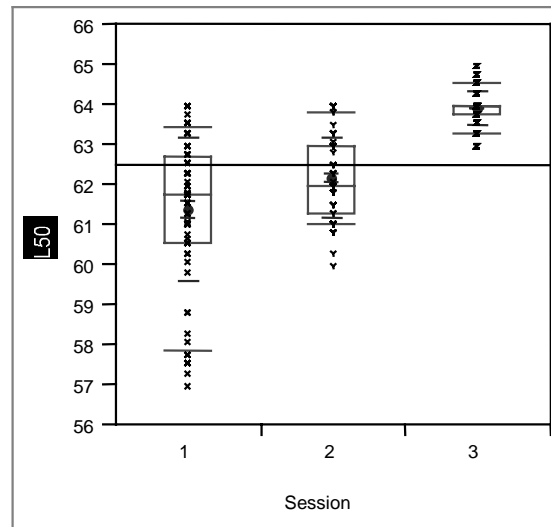
Positive values show pairs of means that are significantly different.
 Comparisons for all pairs using Tukey-Kramer HSD

q*			
2.36027			
Abs(Dif)-LSD	3	2	1
3	-0.41550	1.21668	1.80883
2	1.21668	-0.41550	0.17665
1	1.80883	0.17665	-0.41550

Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 2: Individual Session ANOVA for L50



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	57	57.85676	60.55725	61.77075	62.71024	63.45182	64
2	60	61	61.3	62	63	63.8	64
3	63	63.2724	63.77075	64	64	64.52872	65

Oneway Anova Summary of Fit

RSquare	0.432644
RSquare Adj	0.427317
Root Mean Square Error	1.230586
Mean of Response	62.48833
Observations (or Sum Wgts)	216

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	245.96829	122.984	81.2130
Error	213	322.55458	1.514	Prob>F
C Total	215	568.52287	2.644	<.0001

Means for Oneway Anova

Level	Number	Mean	Std Error
1	72	61.3761	0.14503
2	72	62.1611	0.14503
3	72	63.9278	0.14503

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean
1	72	61.3761	1.81709	0.21415
2	72	62.1611	1.02553	0.12086
3	72	63.9278	0.43530	0.05130

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means Comparisons			
Dif=Mean[i]-Mean[j]	3	2	1
3	0.00000	1.76669	2.55171
2	-1.76669	0.00000	0.78502
1	-2.55171	-0.78502	0.00000

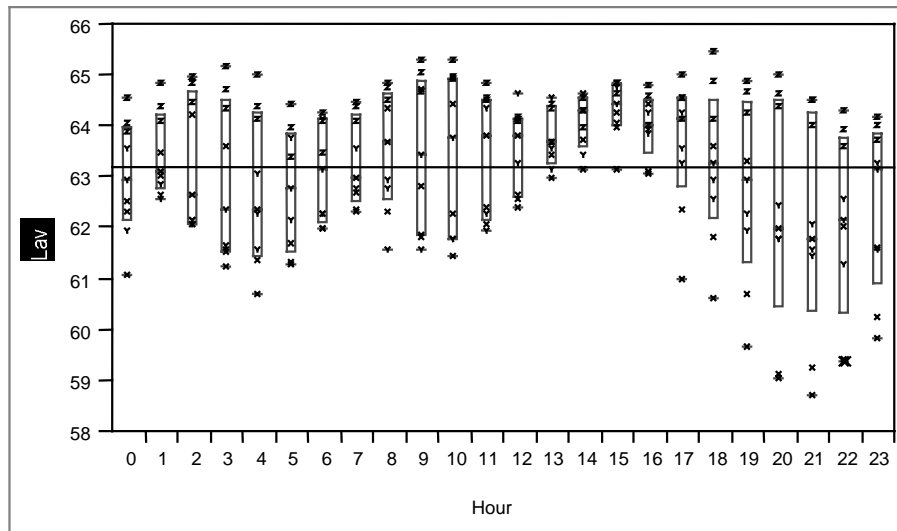
Alpha= 0.05
Comparisons for each pair using Student's t

t			
Abs(Dif)-LSD	3	2	1
3	-0.40429	1.36240	2.14742
2	1.36240	-0.40429	0.38073
1	2.14742	0.38073	-0.40429

Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 3: Hour ANOVA for Lav



Level	Quantiles						maximum
	minimum	10.0%	25.0%	median	75.0%	90.0%	
0	61.10911	61.10911	62.17688	63	64.02091	64.60407	64.60407
1	62.6	62.6	62.8	63.13198	64.28088	64.90288	64.90288
2	62.0875	62.0875	62.15	62.68666	64.71638	65.00399	65.00399
3	61.28641	61.28641	61.57476	62.4	64.56651	65.22751	65.22751
4	60.73854	60.73854	61.48847	62.39731	64.32948	65.05374	65.05374
5	61.30171	61.30171	61.55193	62.8	63.91433	64.47636	64.47636
6	62.00575	62.00575	62.15834	63.2	64.17514	64.32579	64.32579
7	62.35374	62.35374	62.56488	63.02926	64.28106	64.52751	64.52751
8	61.6	61.6	62.5879	63.74102	64.67658	64.90174	64.90174
9	61.6	61.6	61.8777	63.5	64.93992	65.36017	65.36017
10	61.48042	61.48042	61.8	63.8	64.991	65.36802	65.36802
11	62	62	62.19182	63.85262	64.58053	64.91763	64.91763
12	62.45819	62.45819	62.65029	63.84798	64.20631	64.7	64.7
13	63.00518	63.00518	63.3309	63.71811	64.43526	64.6	64.6
14	63.18562	63.18562	63.63455	64.3458	64.61289	64.7	64.7
15	63.20407	63.20407	64.06319	64.5	64.83934	64.91545	64.91545
16	63.11605	63.11605	63.53147	64.05144	64.54472	64.85374	64.85374
17	61.02522	61.02522	62.84667	64.17636	64.5955	65.08227	65.08227
18	60.63516	60.63516	62.22248	63.3	64.56491	65.5376	65.5376
19	59.68806	59.68806	61.36293	63	64.52543	64.92813	64.92813
20	59.07806	59.07806	60.46658	62.00645	64.57774	65.05481	65.05481
21	58.73784	58.73784	60.39021	61.83106	64.30371	64.57694	64.57694
22	59.37855	59.37855	60.3642	62.2	63.81504	64.35599	64.35599
23	59.86673	59.86673	60.92953	63.2	63.91652	64.22637	64.22637

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Oneway Anova Summary of Fit				
RSquare				0.184472
RSquare Adj				0.086778
Root Mean Square Error				1.34946
Mean of Response				63.22445
Observations (or Sum Wgts)				216

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	23	79.08831	3.43862	1.8883
Error	192	349.64026	1.82104	Prob>F
C Total	215	428.72857	1.99409	0.0111

Means for Oneway Anova				
Level	Number	Mean	Std Error	
0	9	63.0313	0.44982	
1	9	63.4879	0.44982	
2	9	63.3326	0.44982	
3	9	62.9482	0.44982	
4	9	62.8028	0.44982	
5	9	62.7957	0.44982	
6	9	63.1152	0.44982	
7	9	63.3336	0.44982	
8	9	63.5727	0.44982	
9	9	63.5200	0.44982	
10	9	63.4486	0.44982	
11	9	63.4631	0.44982	
12	9	63.5758	0.44982	
13	9	63.8008	0.44982	
14	9	64.1219	0.44982	
15	9	64.3815	0.44982	
16	9	64.0526	0.44982	
17	9	63.6742	0.44982	
18	9	63.2984	0.44982	
19	9	62.7832	0.44982	
20	9	62.2809	0.44982	
21	9	62.0260	0.44982	
22	9	62.1045	0.44982	
23	9	62.4354	0.44982	

Std Error uses a pooled estimate of error variance

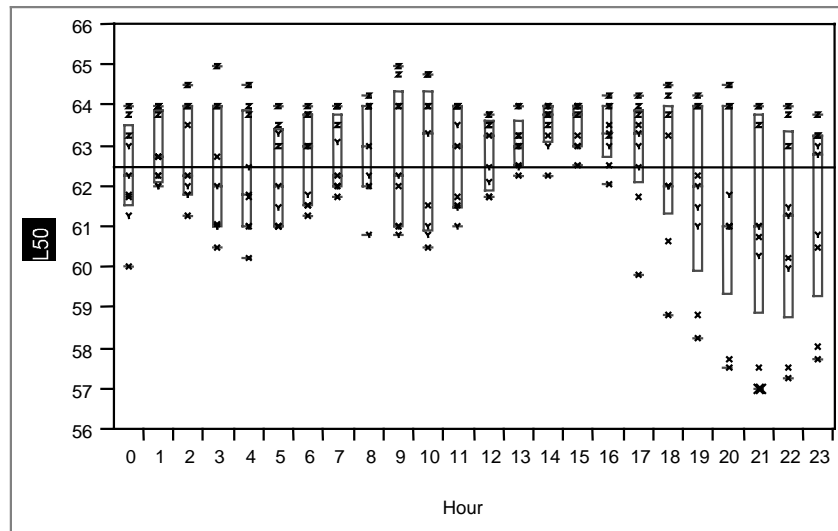
Means and Std Deviations				
Level	Number	Mean	Std Dev	Std Err Mean
0	9	63.0313	1.12875	0.37625
1	9	63.4879	0.81969	0.27323
2	9	63.3326	1.30601	0.43534
3	9	62.9482	1.55612	0.51871
4	9	62.8028	1.50026	0.50009
5	9	62.7957	1.20023	0.40008
6	9	63.1152	0.97724	0.32575
7	9	63.3336	0.85938	0.28646
8	9	63.5727	1.18154	0.39385
9	9	63.5200	1.51915	0.50638
10	9	63.4486	1.58896	0.52965
11	9	63.4631	1.22785	0.40928
12	9	63.5758	0.83081	0.27694
13	9	63.8008	0.57075	0.19025
14	9	64.1219	0.53939	0.17980
15	9	64.3815	0.55003	0.18334

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

16	9	64.0526	0.60170	0.20057
17	9	63.6742	1.28098	0.42699
18	9	63.2984	1.51583	0.50528
19	9	62.7832	1.79605	0.59868
20	9	62.2809	2.20876	0.73625
21	9	62.0260	2.11713	0.70571
22	9	62.1045	1.81907	0.60636
23	9	62.4354	1.64465	0.54822

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Figure 4: Hour ANOVA for L50



Level	Quantiles						maximum
	minimum	10.0%	25.0%	median	75.0%	90.0%	
0	60.05744	60.05744	61.53537	62.3	63.52157	64	64
1	62	62	62.1362	62.77075	63.88537	64	64
2	61.2724	61.2724	61.8	62.2724	64	64.52872	64.52872
3	60.52872	60.52872	61	62	64	65	65
4	60.2724	60.2724	61	61.8	63.88537	64.52872	64.52872
5	61	61	61	62	63.41436	64	64
6	61.2724	61.2724	61.52872	63	63.78537	64	64
7	61.77075	61.77075	62	62.2724	63.76436	64	64
8	60.8	60.8	62	63	64	64.2724	64.2724
9	60.8	60.8	61	62.3	64.38537	65	65
10	60.52872	60.52872	60.9	63.3	64.38537	64.77075	64.77075
11	61	61	61.51436	63	64	64	64
12	61.77075	61.77075	61.93537	63.2724	63.64973	63.8	63.8
13	62.2724	62.2724	62.51436	63	63.6362	64	64
14	62.2724	62.2724	63.1362	63.77075	64	64	64
15	62.52872	62.52872	63	63.77075	64	64	64
16	62.05744	62.05744	62.76436	63.3	64	64.2724	64.2724
17	59.83128	59.83128	62.13537	63.3	63.88537	64.2724	64.2724
18	58.83128	58.83128	61.32142	62	64.02157	64.52872	64.52872
19	58.2724	58.2724	59.91564	62	64	64.2724	64.2724
20	57.52872	57.52872	59.38537	61	64	64.52872	64.52872
21	57	57	58.91436	61	63.76436	64	64
22	57.2724	57.2724	58.76436	61.3	63.38537	64	64
23	57.77075	57.77075	59.29308	62.8	63.2724	63.77075	63.77075

Oneway Anova Summary of Fit

RSquare	0.18246
RSquare Adj	0.084525
Root Mean Square Error	1.555886
Mean of Response	62.48833
Observations (or Sum Wgts)	216

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	23	103.73257	4.51011	1.8631
Error	192	464.79030	2.42078	Prob>F
C Total	215	568.52287	2.64429	0.0127

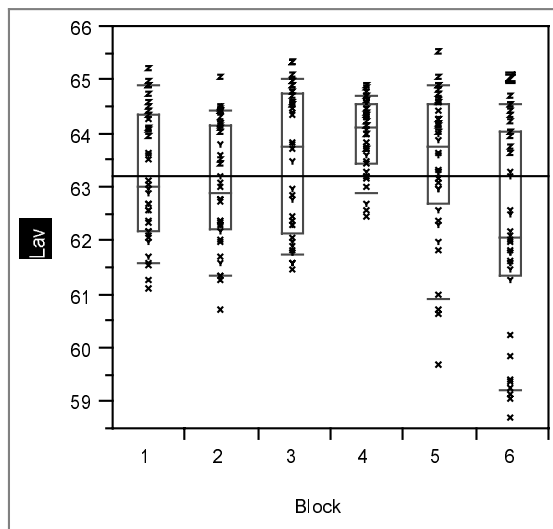
Means for Oneway Anova				
Level	Number	Mean	Std Error	
0	9	62.3670	0.51863	
1	9	62.8761	0.51863	
2	9	62.8002	0.51863	
3	9	62.3730	0.51863	
4	9	62.2936	0.51863	
5	9	62.2587	0.51863	
6	9	62.6334	0.51863	
7	9	62.7413	0.51863	
8	9	62.9303	0.51863	
9	9	62.7634	0.51863	
10	9	62.7443	0.51863	
11	9	62.6999	0.51863	
12	9	62.8936	0.51863	
13	9	63.0940	0.51863	
14	9	63.5128	0.51863	
15	9	63.5080	0.51863	
16	9	63.3289	0.51863	
17	9	62.8860	0.51863	
18	9	62.3687	0.51863	
19	9	61.7943	0.51863	
20	9	61.4031	0.51863	
21	9	61.0142	0.51863	
22	9	60.9605	0.51863	
23	9	61.4747	0.51863	

Std Error uses a pooled estimate of error variance

Means and Std Deviations				
Level	Number	Mean	Std Dev	Std Err Mean
0	9	62.3670	1.27364	0.42455
1	9	62.8761	0.83519	0.27840
2	9	62.8002	1.20683	0.40228
3	9	62.3730	1.63535	0.54512
4	9	62.2936	1.50338	0.50113
5	9	62.2587	1.20802	0.40267
6	9	62.6334	1.10558	0.36853
7	9	62.7413	0.91704	0.30568
8	9	62.9303	1.21990	0.40663
9	9	62.7634	1.69417	0.56472
10	9	62.7443	1.76369	0.58790
11	9	62.6999	1.24325	0.41442
12	9	62.8936	0.85495	0.28498
13	9	63.0940	0.61952	0.20651
14	9	63.5128	0.58146	0.19382
15	9	63.5080	0.56656	0.18885
16	9	63.3289	0.72457	0.24152
17	9	62.8860	1.38146	0.46049
18	9	62.3687	1.83616	0.61205
19	9	61.7943	2.18068	0.72689
20	9	61.4031	2.55213	0.85071
21	9	61.0142	2.57354	0.85785
22	9	60.9605	2.46164	0.82055
23	9	61.4747	2.30666	0.76889

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 5: Hour Block ANOVA for Lav



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	61.11	61.58	62.20	63.03	64.36	64.90	65.23
2	60.74	61.38	62.23	62.91	64.15	64.46	65.05
3	61.48	61.74	62.14	63.77	64.77	65.04	65.37
4	62.46	62.91	63.47	64.13	64.57	64.73	64.92
5	59.69	60.94	62.70	63.77	64.56	64.93	65.54
6	58.74	59.24	61.35	62.07	64.03	64.56	65.05

Oneway Anova Summary of Fit

RSquare	0.15
RSquare Adj	0.13
Root Mean Square Error	1.32
Mean of Response	63.22
Observations (or Sum Wgts)	216.00

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	63.20	12.64	7.2623
Error	210	365.53	1.74	Prob>F
C Total	215	428.73	1.99	<.0001

Means for Oneway Anova

Level	Number	Mean	Std Error
1	36	63.20	0.22
2	36	63.01	0.22
3	36	63.50	0.22
4	36	63.97	0.22
5	36	63.45	0.22
6	36	62.21	0.22

Std Error uses a pooled estimate of error variance

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means and Std Deviations						
Level	Number	Mean	Std Dev	Std Err Mean		
1	36	63.20	1.20	0.20		
2	36	63.01	1.13	0.19		
3	36	63.50	1.33	0.22		
4	36	63.97	0.68	0.11		
5	36	63.45	1.40	0.23		
6	36	62.21	1.88	0.31		

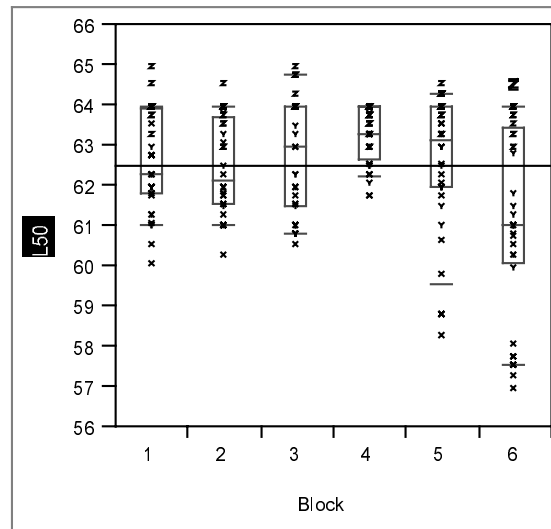
Means Comparisons						
Dif=Mean[i]-Mean[j]	4	3	5	1	2	6
4	0.00	0.47	0.52	0.77	0.96	1.76
3	-0.47	0.00	0.05	0.30	0.49	1.29
5	-0.52	-0.05	0.00	0.25	0.44	1.24
1	-0.77	-0.30	-0.25	0.00	0.19	0.99
2	-0.96	-0.49	-0.44	-0.19	0.00	0.80
6	-1.76	-1.29	-1.24	-0.99	-0.80	0.00

Alpha=	0.05					
Comparisons for each pair using Student's t						
t						
1.97135						
Abs(Dif)-LSD	4	3	5	1	2	6
4	-0.61	-0.14	-0.10	0.16	0.35	1.15
3	-0.14	-0.61	-0.56	-0.31	-0.12	0.68
5	-0.10	-0.56	-0.61	-0.36	-0.17	0.63
1	0.16	-0.31	-0.36	-0.61	-0.42	0.38
2	0.35	-0.12	-0.17	-0.42	-0.61	0.19
6	1.15	0.68	0.63	0.38	0.19	-0.61

Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 6: Hour Block ANOVA for L50



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	60.06	61.00	61.80	62.30	63.94	64.00	65.00
2	60.27	61.00	61.53	62.14	63.71	64.00	64.53
3	60.53	60.80	61.51	63.00	64.00	64.77	65.00
4	61.77	62.22	62.65	63.27	63.95	64.00	64.00
5	58.27	59.53	62.00	63.14	64.00	64.27	64.53
6	57.00	57.53	60.07	61.00	63.46	64.00	64.53

Oneway Anova Summary of Fit

RSquare	0.15
RSquare Adj	0.13
Root Mean Square Error	1.52
Mean of Response	62.49
Observations (or Sum Wgts)	216.00

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	5	83.59	16.72	7.2393
Error	210	484.94	2.31	Prob>F
C Total	215	568.52	2.64	<.0001

Means for Oneway Anova

Level	Number	Mean	Std Error
1	36	62.60	0.25
2	36	62.48	0.25
3	36	62.78	0.25
4	36	63.25	0.25
5	36	62.59	0.25
6	36	61.21	0.25

Std Error uses a pooled estimate of error variance

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means and Std Deviations						
Level	Number	Mean	Std Dev	Std Err Mean		
1	36	62.60	1.24	0.21		
2	36	62.48	1.17	0.19		
3	36	62.78	1.44	0.24		
4	36	63.25	0.69	0.12		
5	36	62.59	1.66	0.28		
6	36	61.21	2.38	0.40		

Means Comparisons						
Dif=Mean[i]-Mean[j]	4	3	1	5	2	6
4	0.00	0.47	0.65	0.66	0.77	2.04
3	-0.47	0.00	0.18	0.19	0.30	1.57
1	-0.65	-0.18	0.00	0.01	0.12	1.39
5	-0.66	-0.19	-0.01	0.00	0.11	1.38
2	-0.77	-0.30	-0.12	-0.11	0.00	1.27
6	-2.04	-1.57	-1.39	-1.38	-1.27	0.00

Alpha=	0.05					
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Comparisons for each pair using Student's t						
t 1.97135						
Abs(Dif)-LSD	4	3	1	5	2	6
4	-0.71	-0.24	-0.06	-0.05	0.06	1.33
3	-0.24	-0.71	-0.53	-0.52	-0.40	0.87
1	-0.06	-0.53	-0.71	-0.70	-0.58	0.68
5	-0.05	-0.52	-0.70	-0.71	-0.59	0.68
2	0.06	-0.40	-0.58	-0.59	-0.71	0.56
6	1.33	0.87	0.68	0.68	0.56	-0.71

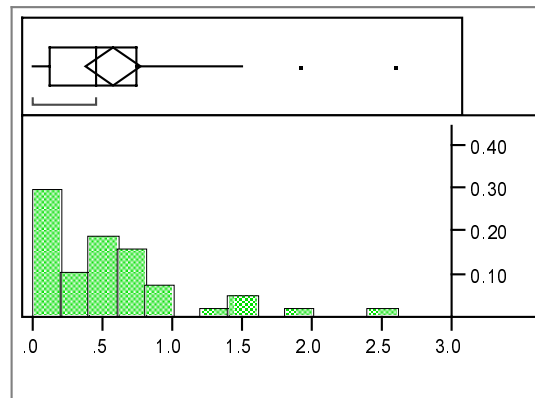
Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 5. INTERDAY DIFFERENCES

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: All Interday Differences Summary Statistics for Lav (dBA)

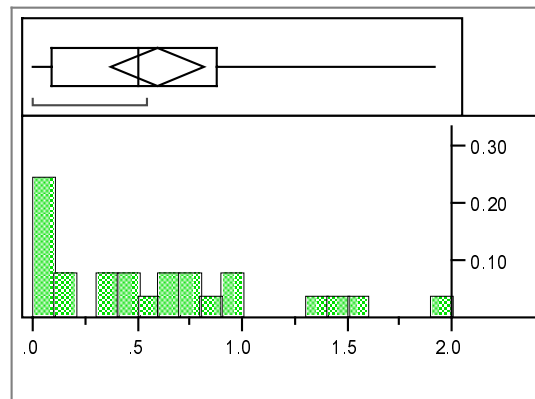


Quantiles		
maximum	100.0%	2.60
	99.5%	2.60
	97.5%	2.60
	90.0%	1.49
	75.0%	0.75
quartile	50.0%	0.46
quartile	25.0%	0.13
	10.0%	0.04
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00

Moments	
Mean	0.59
Std Dev	0.58
Std Error Mean	0.10
Upper 95% Mean	0.78
Lower 95% Mean	0.39
N	36.00
Sum Weights	36.00
Sum	21.07
Variance	0.34
Skewness	1.70
Kurtosis	3.39
CV	99.06

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

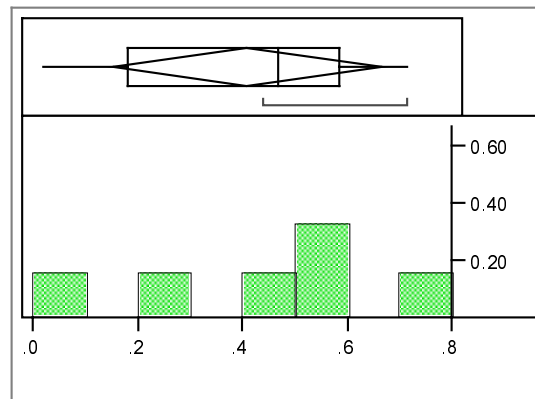
Figure 2: Interday Group 1 Interday Differences Summary Statistics for Lav (dBA)



Quantiles		
maximum	100.0%	1.92
	99.5%	1.92
	97.5%	1.92
	90.0%	1.50
	75.0%	0.88
quartile	50.0%	0.51
quartile	25.0%	0.09
	10.0%	0.05
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00
Moments		
Mean		0.60
Std Dev		0.54
Std Error Mean		0.11
Upper 95% Mean		0.83
Lower 95% Mean		0.38
N		24.00
Sum Weights		24.00
Sum		14.44
Variance		0.29
Skewness		0.93
Kurtosis		0.22
CV		88.91

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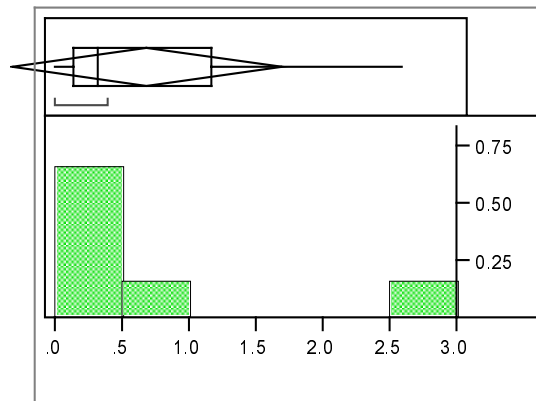
Figure 3: Interday Group 2 Interday Differences Summary Statistics for Lav (dBA)



Quantiles		
maximum	100.0%	0.72
	99.5%	0.72
	97.5%	0.72
	90.0%	0.72
	75.0%	0.59
quartile	50.0%	0.47
quartile	25.0%	0.18
	10.0%	0.02
	2.5%	0.02
	0.5%	0.02
minimum	0.0%	0.02
Moments		
Mean		0.41
Std Dev		0.25
Std Error Mean		0.10
Upper 95% Mean		0.67
Lower 95% Mean		0.15
N		6.00
Sum Weights		6.00
Sum		2.47
Variance		0.06
Skewness		-0.65
Kurtosis		0.07
CV		59.69

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

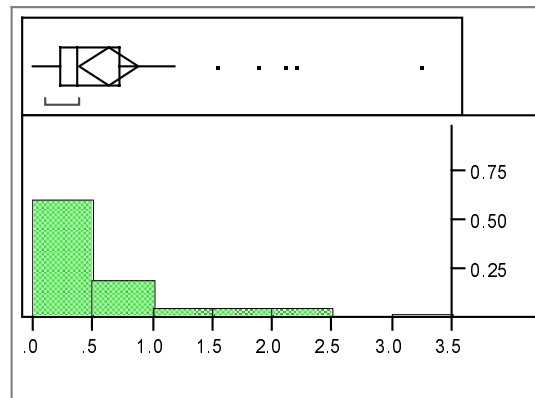
Figure 4: Interday Group 3 Differences Summary Statistics for Lav (dBA)



Quantiles		
maximum	100.0%	2.60
	99.5%	2.60
	97.5%	2.60
	90.0%	2.60
	75.0%	1.17
quartile	50.0%	0.33
quartile	25.0%	0.15
	10.0%	0.01
	2.5%	0.01
	0.5%	0.01
minimum	0.0%	0.01
Moments		
Mean		0.69
Std Dev		0.96
Std Error Mean		0.39
Upper 95% Mean		1.70
Lower 95% Mean		-0.32
N		6.00
Sum Weights		6.00
Sum		4.15
Variance		0.92
Skewness		2.15
Kurtosis		4.83
CV		138.77

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 5: All Interday Differences Summary Statistics for L50 (dBA)

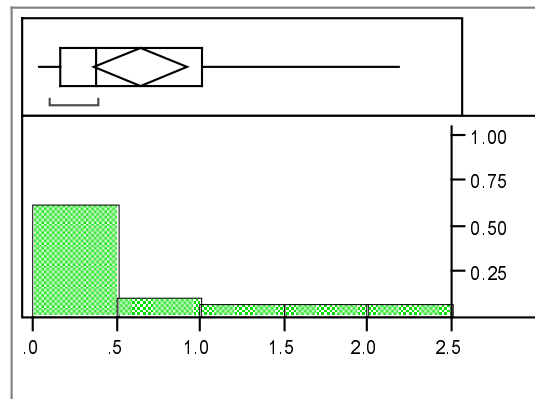


Quantiles		
maximum	100.0%	3.25
	99.5%	3.25
	97.5%	3.25
	90.0%	1.95
	75.0%	0.73
quartile	50.0%	0.38
quartile	25.0%	0.23
	10.0%	0.11
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00

Moments	
Mean	0.64
Std Dev	0.72
Std Error Mean	0.12
Upper 95% Mean	0.89
Lower 95% Mean	0.40
N	36.00
Sum Weights	36.00
Sum	23.15
Variance	0.52
Skewness	2.09
Kurtosis	4.41
CV	111.81

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

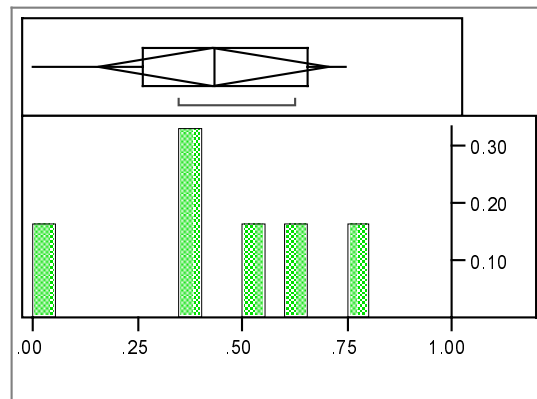
Figure 6: Interday Group 1 Interday Differences Summary Statistics for L50 (dBA)



Quantiles		
maximum	100.0%	2.19
	99.5%	2.19
	97.5%	2.19
	90.0%	2.00
	75.0%	1.01
quartile	50.0%	0.39
quartile	25.0%	0.17
	10.0%	0.11
	2.5%	0.05
	0.5%	0.05
minimum	0.0%	0.05
Moments		
Mean		0.65
Std Dev		0.66
Std Error Mean		0.13
Upper 95% Mean		0.93
Lower 95% Mean		0.38
N		24.00
Sum Weights		24.00
Sum		15.70
Variance		0.43
Skewness		1.38
Kurtosis		0.70
CV		100.65

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

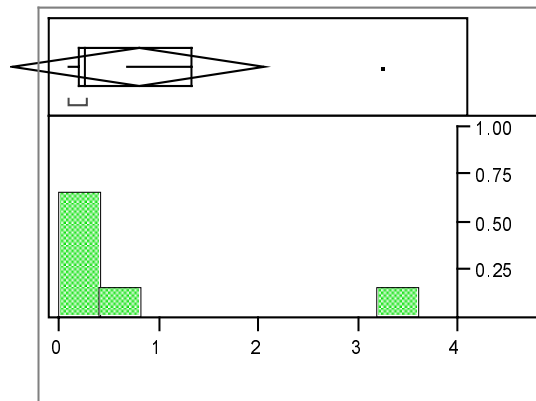
Figure 7: Interday Group 2 Interday Differences Summary Statistics for L50 (dBA)



Quantiles		
maximum	100.0%	0.75
	99.5%	0.75
	97.5%	0.75
	90.0%	0.75
	75.0%	0.66
quartile	50.0%	0.44
quartile	25.0%	0.26
	10.0%	0.00
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00
Moments		
Mean		0.43
Std Dev		0.26
Std Error Mean		0.11
Upper 95% Mean		0.71
Lower 95% Mean		0.16
N		6.00
Sum Weights		6.00
Sum		2.60
Variance		0.07
Skewness		-0.72
Kurtosis		0.79
CV		60.27

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 8: Interday Group 3 Interday Differences Summary Statistics for L50 (dBA)

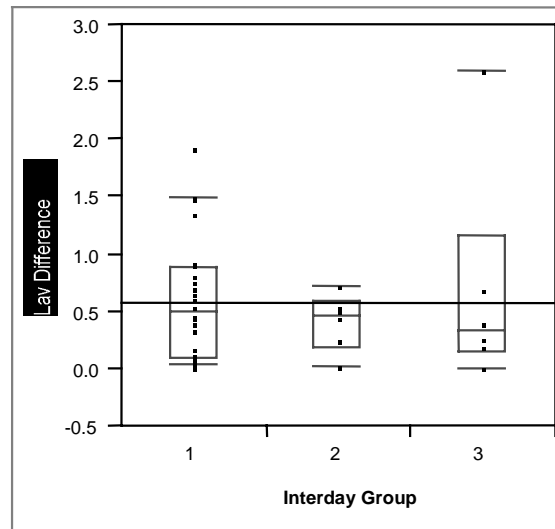


Quantiles		
maximum	100.0%	3.25
	99.5%	3.25
	97.5%	3.25
	90.0%	3.25
	75.0%	1.34
quartile	50.0%	0.27
quartile	25.0%	0.21
	10.0%	0.11
	2.5%	0.11
	0.5%	0.11
minimum	0.0%	0.11

Moments	
Mean	0.81
Std Dev	1.21
Std Error Mean	0.49
Upper 95% Mean	2.08
Lower 95% Mean	-0.46
N	6.00
Sum Weights	6.00
Sum	4.85
Variance	1.47
Skewness	2.31
Kurtosis	5.42
CV	150.03

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 9: ANOVA of Group Interday Differences for Lav (dBA)



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	0.00	0.05	0.09	0.51	0.88	1.50	1.92
2	0.02	0.02	0.18	0.47	0.59	0.72	0.72
3	0.01	0.01	0.15	0.33	1.17	2.60	2.60

Oneway Anova Summary of Fit

RSquare	0.02
RSquare Adj	-0.04
Root Mean Square Error	0.59
Mean of Response	0.59
Observations (or Sum Wgts)	36.00

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	0.26	0.13	0.3686
Error	33	11.50	0.35	Prob>F
C Total	35	11.76	0.34	0.69

Means for Oneway Anova

Level	Number	Mean	Std Error
1	24	0.60	0.12
2	6	0.41	0.24
3	6	0.69	0.24

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean
1	24	0.60	0.54	0.11
2	6	0.41	0.25	0.10
3	6	0.69	0.96	0.39

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means Comparisons			
Dif=Mean[i]-Mean[j]	3	1	2
3	0.00	0.09	0.28
1	-0.09	0.00	0.19
2	-0.28	-0.19	0.00

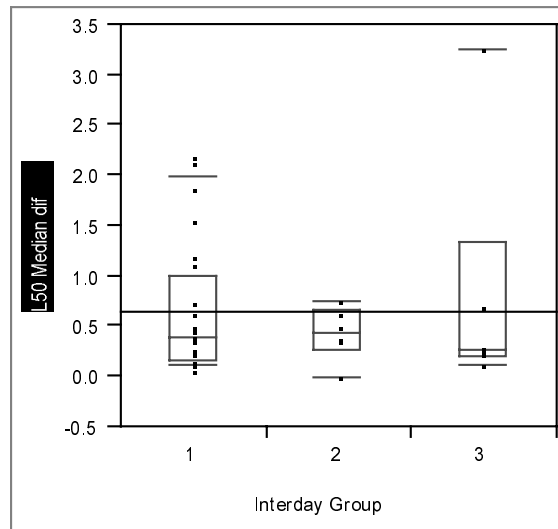
Alpha= 0.05
Comparisons for each pair using Student's t

t			
Abs(Dif)-LSD	3	1	2
3	-0.69	-0.46	-0.41
1	-0.46	-0.35	-0.36
2	-0.41	-0.36	-0.69

Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 10: ANOVA of Group Interday Differences for L50



Level	Quantiles						
	minimum	10.0%	25.0%	median	75.0%	90.0%	maximum
1	0.05	0.11	0.17	0.39	1.01	2.00	2.19
2	0.00	0.00	0.26	0.44	0.66	0.75	0.75
3	0.11	0.11	0.21	0.27	1.34	3.25	3.25

Oneway Anova Summary of Fit

RSquare	0.02
RSquare Adj	-0.04
Root Mean Square Error	0.73
Mean of Response	0.64
Observations (or Sum Wgts)	36.00

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	2	0.43	0.22	0.4019
Error	33	17.67	0.54	Prob>F
C Total	35	18.10	0.52	0.6723

Means for Oneway Anova

Level	Number	Mean	Std Error
1	24	0.65	0.15
2	6	0.43	0.30
3	6	0.81	0.30

Std Error uses a pooled estimate of error variance

Means and Std Deviations

Level	Number	Mean	Std Dev	Std Err Mean
1	24	0.65	0.66	0.13
2	6	0.43	0.26	0.11
3	6	0.81	1.21	0.49

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Means Comparisons			
Dif=Mean[i]-Mean[j]	3	1	2
3	0.00	0.15	0.37
1	-0.15	0.00	0.22
2	-0.37	-0.22	0.00

Alpha= 0.05
Comparisons for each pair using Student's t

t			
Abs(Dif)-LSD	3	1	2
3	-0.86	-0.53	-0.48
1	-0.53	-0.43	-0.46
2	-0.48	-0.46	-0.86

Positive values show pairs of means that are significantly different.

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

ATTACHMENT 6: CORRELATION MATRIX

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Correlation Matrix for the Ambient Noise Model

Variable	Lav	Tide Height	Wave Height	Wind (m/s)	Unit 1 MW	Unit 2 MW	Unit 3 MW	Unit 4 MW	Block 1	Block 2	Block 3	Block 4	Block 5
Lav	1.000												
Tide Height	-0.125	1.000											
Wave Height	0.541	0.052	1.000										
Wind (m/s)	0.216	0.381	-0.044	1.000									
Unit 1 MW	-0.594	0.102	-0.327	-0.151	1.000								
Unit 2 MW	0.278	-0.065	0.262	-0.015	-0.115	1.000							
Unit 3 MW	0.127	0.591	0.144	0.637	0.088	-0.022	1.000						
Unit 4 MW	0.151	0.578	0.170	0.601	0.103	0.003	0.915	1.000					
Block 1	-0.008	-0.370	0.058	-0.364	0.039	0.058	-0.347	-0.335	1.000				
Block 2	-0.067	-0.489	-0.010	-0.463	-0.061	0.035	-0.527	-0.517	-0.200	1.000			
Block 3	0.088	0.105	-0.046	-0.061	-0.133	0.045	-0.237	-0.184	-0.200	-0.200	1.000		
Block 4	0.237	0.010	-0.078	0.545	-0.103	0.004	0.346	0.382	-0.200	-0.200	-0.200	1.000	
Block 5	0.072	0.274	-0.035	0.392	0.145	-0.018	0.406	0.346	-0.200	-0.200	-0.200	-0.200	1.000

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

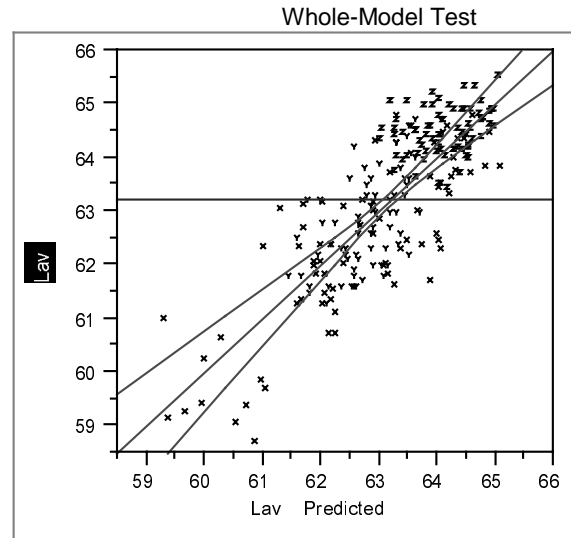
ATTACHMENT 7. AMBIENT NOISE MODELS

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 1: Ambient Noise Model – Model Statistics for the Ambient Noise Model including all Power Plant data.

Response: Lav					
Summary of Fit					
RSquare	0.674519				
RSquare Adj	0.655279				
Root Mean Square Error	0.829098				
Mean of Response	63.22445				
Observations (or Sum Wgts)	216				
Parameter Estimates					
Term	Estimate	Std Error	t Ratio	Prob> t	Std Beta
Intercept	62.67	0.4719	132.83	<.0001	0.00
Tide Height	-0.43	0.1550	-2.74	0.0066	-0.17
Wave Height	3.49	0.4308	8.11	<.0001	0.39
Unit 1 MW	-0.03	0.0033	-9.40	<.0001	-0.45
Unit 2 MW	0.01	0.0049	2.01	0.0456	0.08
Unit 3 MW	0.00	0.0018	1.23	0.2197	0.14
Unit 4 MW	0.00	0.0017	0.98	0.3285	0.10
Wind (m/s)	-0.10	0.0599	-1.69	0.0929	-0.13
DBlock 1[0-1]	-0.43	0.1509	-2.82	0.0053	-0.23
DBlock 2[0-1]	-0.33	0.1697	-1.92	0.0566	-0.17
DBlock 3[0-1]	-0.66	0.1261	-5.23	<.0001	-0.35
DBlock 4[0-1]	-0.81	0.1302	-6.22	<.0001	-0.43
DBlock 5[0-1]	-0.73	0.1131	-6.50	<.0001	-0.39
Effect Test					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob>F
Tide Height	1	1	5.175411	7.5289	0.0066
Wave Height	1	1	45.211466	65.7714	<.0001
Unit 1 MW	1	1	60.678876	88.2726	<.0001
Unit 2 MW	1	1	2.781835	4.0469	0.0456
Unit 3 MW	1	1	1.041866	1.5157	0.2197
Unit 4 MW	1	1	0.659418	0.9593	0.3285
Wind (m/s)	1	1	1.959487	2.8506	0.0929
DBlock 1	1	1	5.470523	7.9582	0.0053
DBlock 2	1	1	2.526638	3.6756	0.0566
DBlock 3	1	1	18.809870	27.3636	<.0001
DBlock 4	1	1	26.634018	38.7458	<.0001
DBlock 5	1	1	29.016472	42.2117	<.0001

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS



Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	12	289.18564	24.0988	35.0577
Error	203	139.54293	0.6874	Prob>F
C Total	215	428.72857		<.0001

Tide Height Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
5.1754110	7.5289	1	0.0066	

Wave Height Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
45.211466	65.7714	1	<.0001	

Unit 1 MW Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
60.678876	88.2726	1	<.0001	

Unit 2 MW Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
2.7818346	4.0469	1	0.0456	

Unit 3 MW Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
1.0418664	1.5157	1	0.2197	

Unit 4 MW Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
0.65941820	0.9593	1	0.3285	

Wind (m/s) Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	

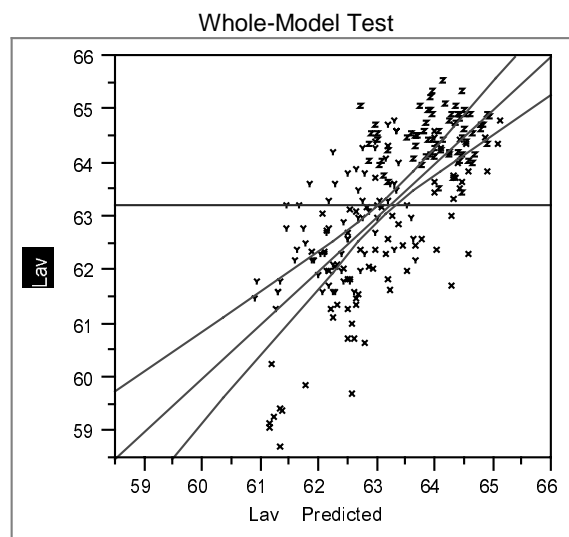
APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

	1.9594873	2.8506	1	0.0929
DBlock 1 Effect Test				
	Sum of Squares	F Ratio	DF	Prob>F
	5.4705233	7.9582	1	0.0053
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.76910351	0.2448039822	63.2293	
1	65.62059696	0.4886772331	63.2000	
DBlock 2 Effect Test				
	Sum of Squares	F Ratio	DF	Prob>F
	2.5266379	3.6756	1	0.0566
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.86957280	0.2378422608	63.2670	
1	65.52012766	0.5041666580	63.0118	
DBlock 3 Effect Test				
	Sum of Squares	F Ratio	DF	Prob>F
	18.809870	27.3636	1	<.0001
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.53519652	0.2620116014	63.1691	
1	65.85450394	0.4651192954	63.5011	
DBlock 4 Effect Test				
	Sum of Squares	F Ratio	DF	Prob>F
	26.634018	38.7458	1	<.0001
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.38448777	0.2880926226	63.0753	
1	66.00521270	0.4517537075	63.9700	
DBlock 5 Effect Test				
	Sum of Squares	F Ratio	DF	Prob>F
	29.016472	42.2117	1	<.0001
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.46029590	0.3029503279	63.1789	
1	65.92940457	0.4323975396	63.4521	

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Figure 2: Modified Ambient Noise Model – Model Statistics for the Ambient Noise Model excluding all Power Plant data.

Response: Lav					
Summary of Fit					
RSquare	0.522369				
RSquare Adj	0.50391				
Root Mean Square Error	0.994608				
Mean of Response	63.22445				
Observations (or Sum Wgts)	216				
Parameter Estimates					
Term	Estimate	Std Error	t Ratio	Prob> t	Std Beta
Intercept	60.844661	0.517083	117.67	<.0001	0
Tide Height	-0.450264	0.182449	-2.47	0.0144	-0.1811
Wave Height	5.4530214	0.436142	12.50	<.0001	0.608131
Wind (m/s)	0.0913153	0.067338	1.36	0.1766	0.113488
DBlock 1[0-1]	-0.360018	0.156967	-2.29	0.0228	-0.19047
DBlock 2[0-1]	-0.315076	0.169169	-1.86	0.0640	-0.16669
DBlock 3[0-1]	-0.691725	0.124979	-5.53	<.0001	-0.36596
DBlock 4[0-1]	-0.82121	0.152208	-5.40	<.0001	-0.43446
DBlock 5[0-1]	-0.623887	0.133668	-4.67	<.0001	-0.33007
Effect Test					
Source	Nparm	DF	Sum of Squares	F Ratio	Prob>F
Tide Height	1	1	6.02498	6.0905	0.0144
Wave Height	1	1	154.64002	156.3211	<.0001
Wind (m/s)	1	1	1.81917	1.8389	0.1766
DBlock 1	1	1	5.20395	5.2605	0.0228
DBlock 2	1	1	3.43157	3.4689	0.0640
DBlock 3	1	1	30.30364	30.6331	<.0001
DBlock 4	1	1	28.79645	29.1095	<.0001
DBlock 5	1	1	21.55082	21.7851	<.0001



APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	8	223.95471	27.9943	28.2987
Error	207	204.77386	0.9892	Prob>F
C Total	215	428.72857		<.0001

Tide Height Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
6.0249803	6.0905	1	0.0144	

Wave Height Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
154.64002	156.3211	1	<.0001	

Wind (m/s) Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
1.8191701	1.8389	1	0.1766	

DBlock 1 Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
5.2039485	5.2605	1	0.0228	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	64.73904646	0.2741662342	63.2293
1	65.45908186	0.5139407415	63.2000

DBlock 2 Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
3.4315699	3.4689	1	0.0640	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	64.78398811	0.2716756558	63.2670
1	65.41414021	0.5229277181	63.0118

DBlock 3 Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
30.303642	30.6331	1	<.0001	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	64.40733953	0.2947334121	63.1691
1	65.79078879	0.4841451503	63.5011

DBlock 4 Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
28.796445	29.1095	1	<.0001	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	64.27785408	0.2902054985	63.0753
1	65.92027423	0.5021353253	63.9700

DBlock 5

APPENDIX A: AMBIENT NOISE VARIABILITY ANALYSIS

Effect Test				
Sum of Squares		F Ratio	DF	Prob>F
21.550819		21.7851	1	<.0001
Least Squares Means				
Level	Least Sq Mean	Std Error	Mean	
0	64.47517707	0.3059630975	63.1789	
1	65.72295125	0.4818146223	63.4521	

APPENDIX B: OPERATIONAL ANALYSIS

APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 1. SUMMARY STATISTICS

ATTACHMENT 2. TIME PLOTS

ATTACHMENT 3. OPERATIONAL SUMMARY STATISTICS AND ANOVAs

ATTACHMENT 4. CORRELATION MATRIX

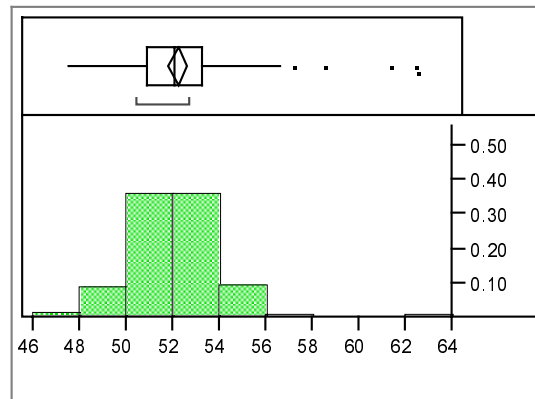
ATTACHMENT 5. OPERATIONAL MODEL

APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 1. SUMMARY STATISTICS

APPENDIX B: OPERATIONAL ANALYSIS

Figure 1: Summary Statistics for REF 2 Lav (dBA)

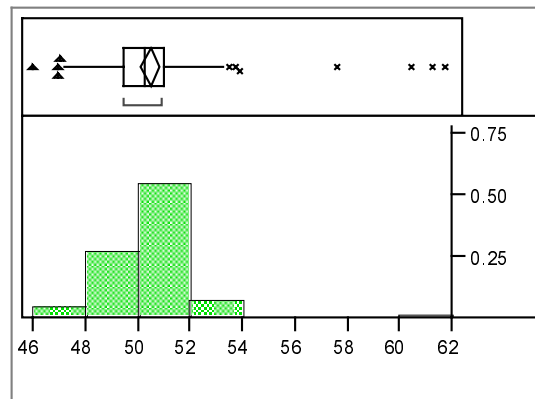


Quantiles		
maximum	100.0%	62.55
	99.5%	62.55
	97.5%	59.67
	90.0%	54.84
	75.0%	53.31
quartile	50.0%	52.09
quartile	25.0%	50.99
	10.0%	49.49
	2.5%	48.03
	0.5%	47.60
minimum	0.0%	47.60

Moments	
Mean	52.28
Std Dev	2.35
Std Error Mean	0.20
Upper 95% Mean	52.67
Lower 95% Mean	51.90
N	144.00
Sum Weights	144.00
Sum	7528.99
Variance	5.53
Skewness	1.56
Kurtosis	5.29
CV	4.50

APPENDIX B: OPERATIONAL ANALYSIS

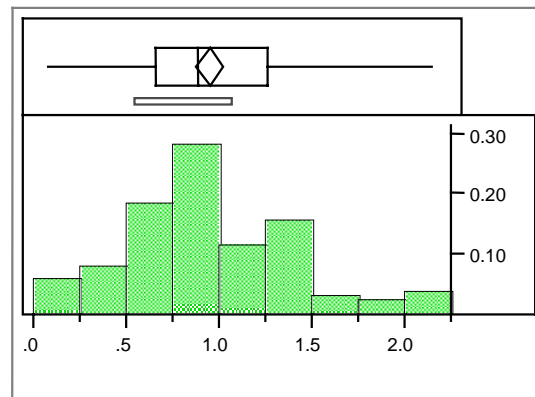
Figure 2: Summary Statistics for REF 2 L50 (dBA)



Quantiles		
maximum	100.0%	61.82
	99.5%	61.82
	97.5%	58.74
	90.0%	52.27
	75.0%	51.06
quartile	50.0%	50.30
quartile	25.0%	49.53
	10.0%	48.53
	2.5%	47.04
	0.5%	46.00
minimum	0.0%	46.00
Moments		
Mean		50.54
Std Dev		2.19
Std Error Mean		0.18
Upper 95% Mean		50.90
Lower 95% Mean		50.18
N		144.00
Sum Weights		144.00
Sum		7277.30
Variance		4.78
Skewness		2.55
Kurtosis		11.13
CV		4.33

APPENDIX B: OPERATIONAL ANALYSIS

Figure 3: Summary Statistics for Tide Height (meters)

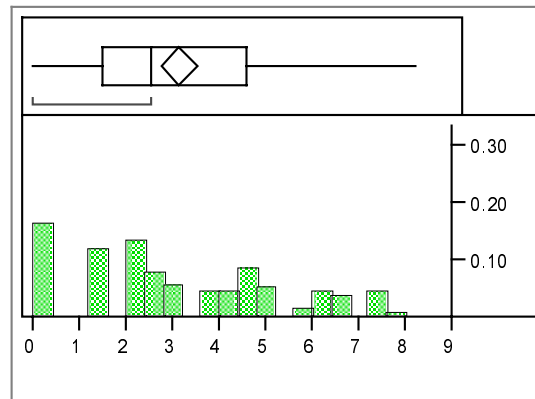


Quantiles		
maximum	100.0%	2.15
	99.5%	2.15
	97.5%	2.03
	90.0%	1.61
	75.0%	1.27
quartile	50.0%	0.90
quartile	25.0%	0.66
	10.0%	0.34
	2.5%	0.11
	0.5%	0.09
minimum	0.0%	0.09

Moments	
Mean	0.96
Std Dev	0.47
Std Error Mean	0.04
Upper 95% Mean	1.03
Lower 95% Mean	0.88
N	144.00
Sum Weights	144.00
Sum	137.82
Variance	0.22
Skewness	0.47
Kurtosis	0.02
CV	48.78

APPENDIX B: OPERATIONAL ANALYSIS

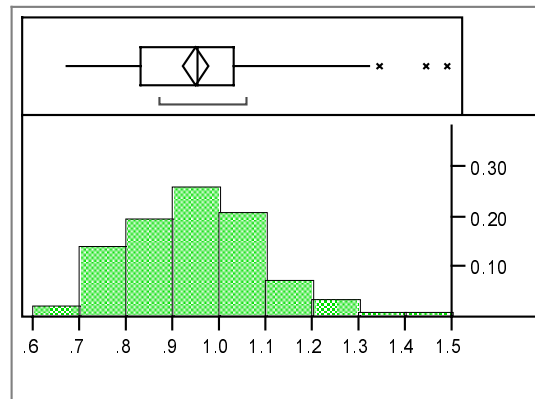
Figure 4: Summary Statistics for Wind Speed (m/s)



Quantiles		
maximum	100.0%	8.24
	99.5%	8.24
	97.5%	7.40
	90.0%	6.69
	75.0%	4.63
quartile	50.0%	2.57
quartile	25.0%	1.54
	10.0%	0.00
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00
Moments		
Mean		3.18
Std Dev		2.25
Std Error Mean		0.19
Upper 95% Mean		3.55
Lower 95% Mean		2.81
N		144.00
Sum Weights		144.00
Sum		457.65
Variance		5.05
Skewness		0.31
Kurtosis		-0.85
CV		70.70

APPENDIX B: OPERATIONAL ANALYSIS

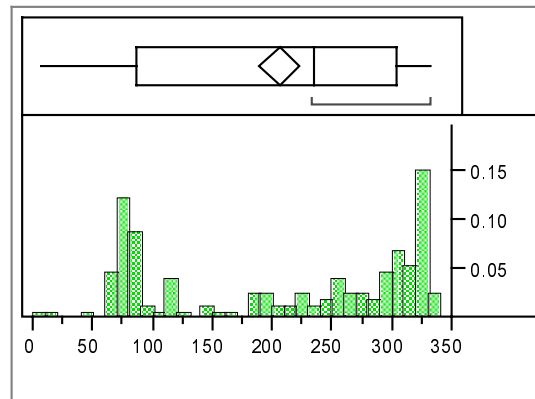
Figure 5: Summary Statistics for Wave Height (meters)



Quantiles		
maximum	100.0%	1.49
	99.5%	1.49
	97.5%	1.33
	90.0%	1.15
	75.0%	1.03
quartile	50.0%	0.96
quartile	25.0%	0.83
	10.0%	0.75
	2.5%	0.69
minimum	0.5%	0.68
	0.0%	0.68
Moments		
Mean		0.95
Std Dev		0.16
Std Error Mean		0.01
Upper 95% Mean		0.98
Lower 95% Mean		0.93
N		144.00
Sum Weights		144.00
Sum		137.12
Variance		0.02
Skewness		0.66
Kurtosis		0.83
CV		16.40

APPENDIX B: OPERATIONAL ANALYSIS

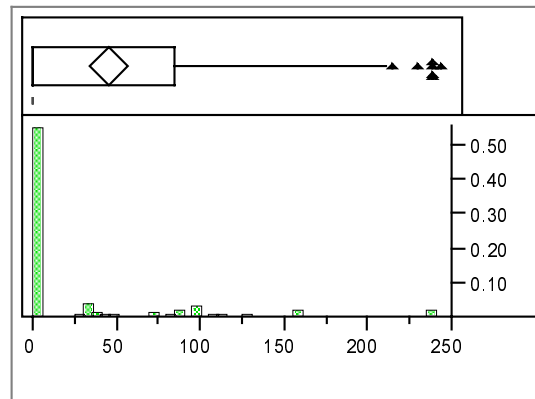
Figure 6: Summary Statistics for Unit 3 Power (megawatts)



Quantiles		
maximum	100.0%	333.26
	99.5%	333.26
	97.5%	330.52
	90.0%	324.54
	75.0%	305.06
quartile	50.0%	235.55
quartile	25.0%	87.22
	10.0%	70.57
	2.5%	59.91
	0.5%	8.54
minimum	0.0%	8.54
Moments		
Mean		207.09
Std Dev		103.64
Std Error Mean		8.64
Upper 95% Mean		224.16
Lower 95% Mean		190.02
N		144.00
Sum Weights		144.00
Sum		29821.29
Variance		10741.30
Skewness		-0.27
Kurtosis		-1.57
CV		50.05

APPENDIX B: OPERATIONAL ANALYSIS

Figure 7: Summary Statistics for Unit 4 Power (megawatts)



Quantiles		
maximum	100.0%	243.98
	99.5%	243.98
	97.5%	238.84
	90.0%	159.39
	75.0%	85.41
quartile	50.0%	0.00
quartile	25.0%	0.00
	10.0%	0.00
	2.5%	0.00
	0.5%	0.00
minimum	0.0%	0.00
Moments		
Mean		46.35
Std Dev		69.11
Std Error Mean		5.76
Upper 95% Mean		57.73
Lower 95% Mean		34.96
N		144.00
Sum Weights		144.00
Sum		6673.96
Variance		4775.79
Skewness		1.48
Kurtosis		1.17
CV		149.11

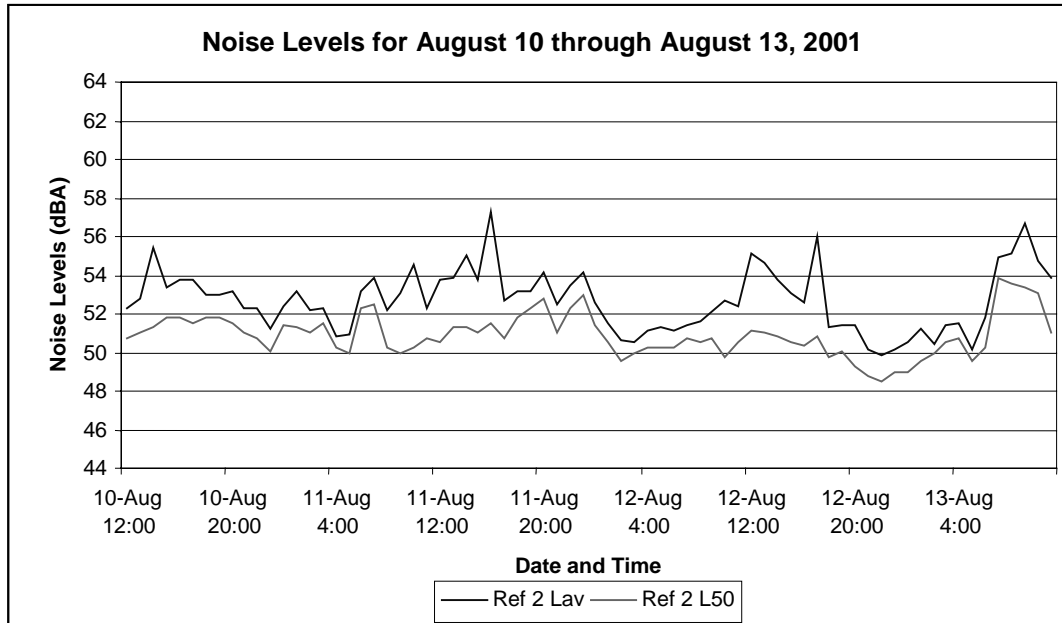
APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 2. TIME PLOTS

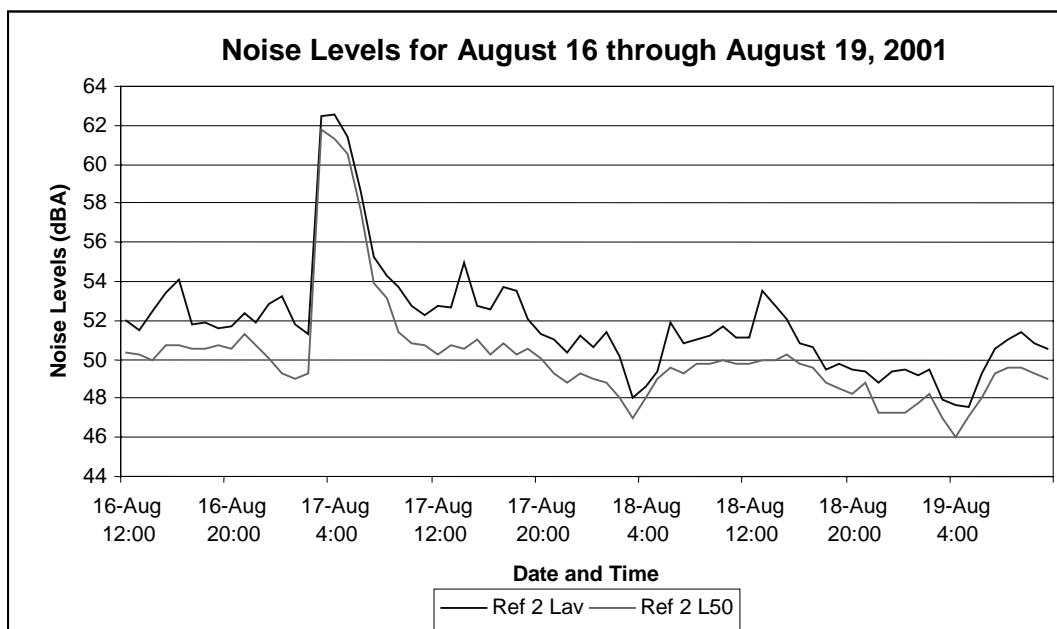
APPENDIX B: OPERATIONAL ANALYSIS

Figure 1: Individual Session Time Plots for Noise

Session 4



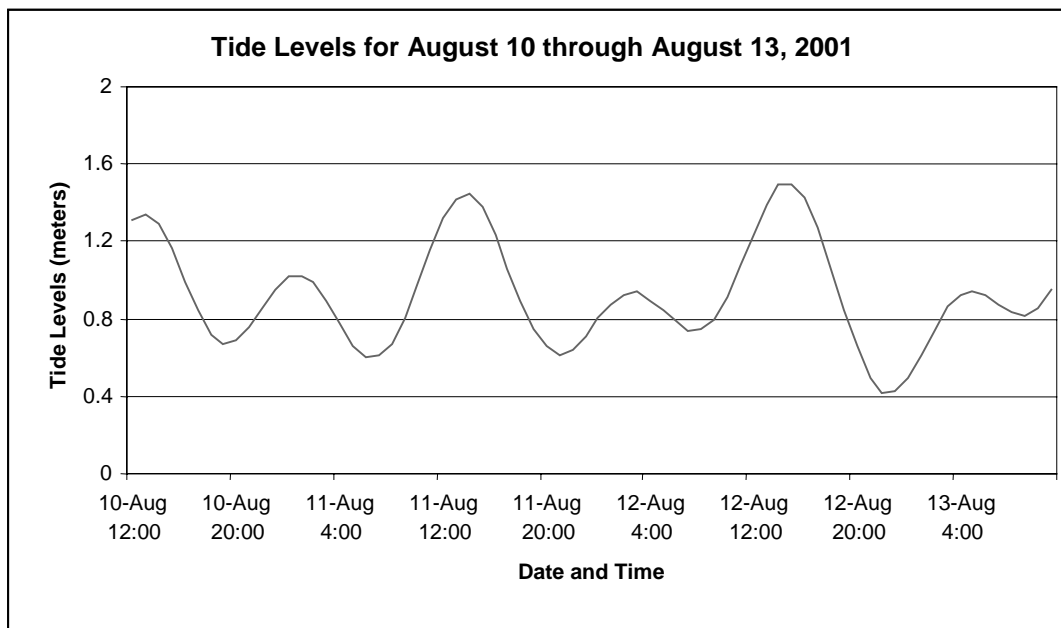
Session 5



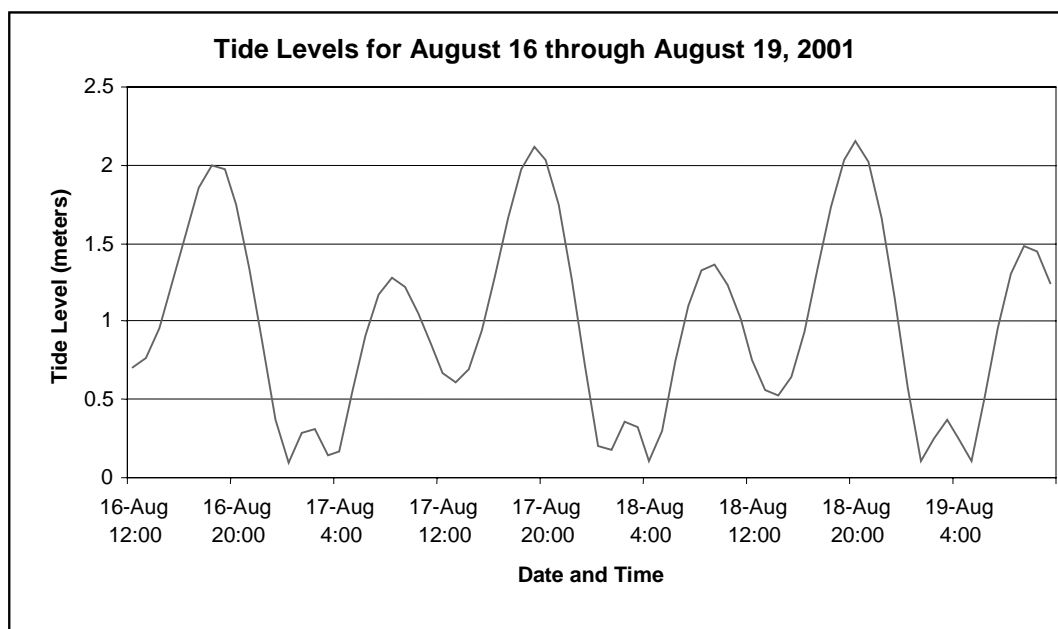
APPENDIX B: OPERATIONAL ANALYSIS

Figure 2: Individual Session Time Plots for Tide Height (meters)

Session 4



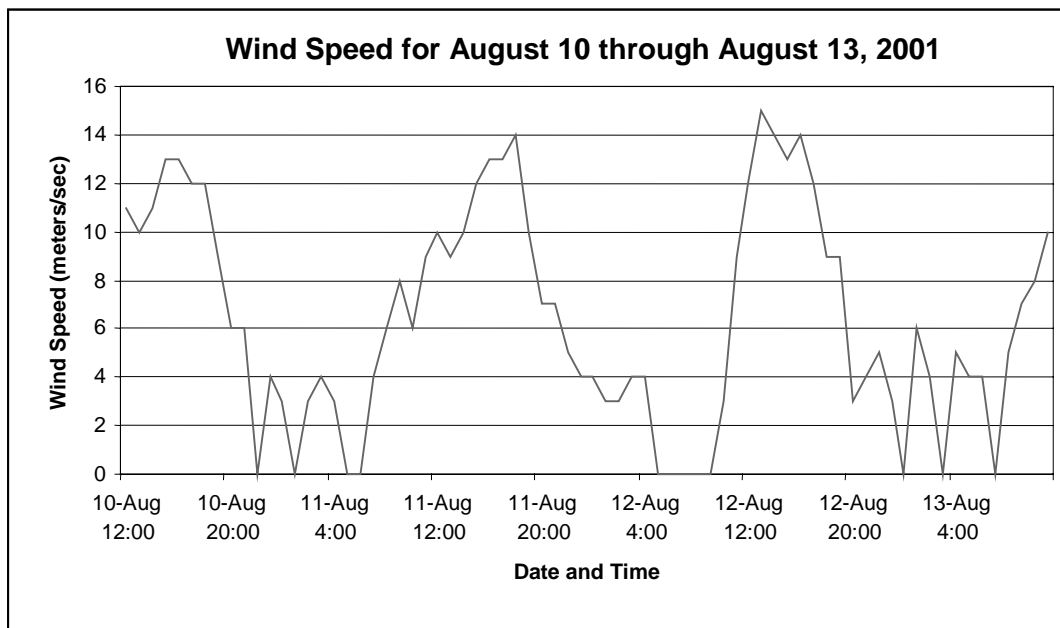
Session 5



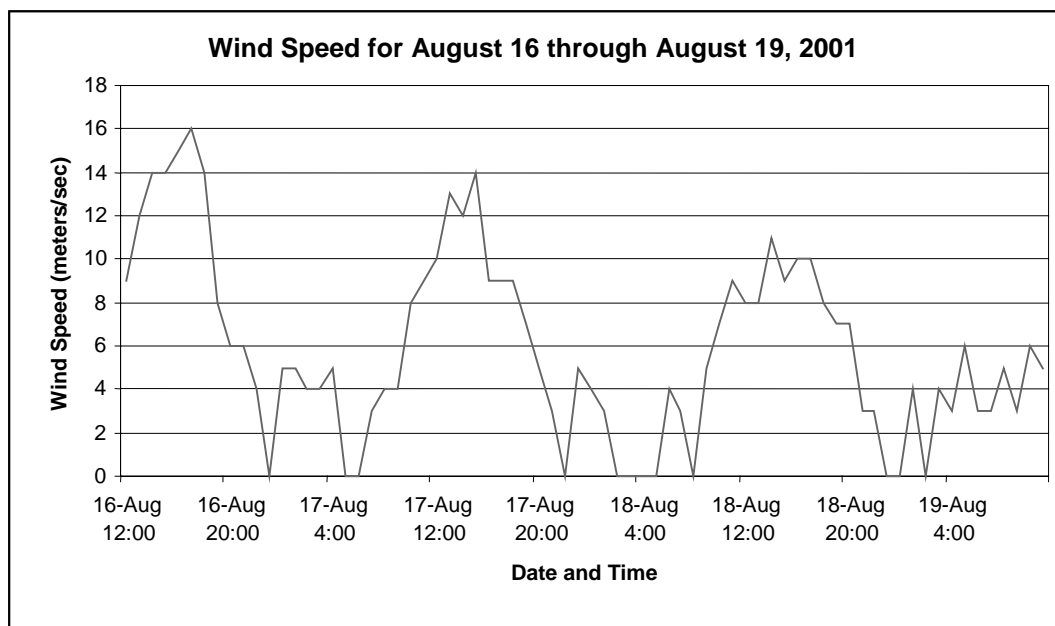
APPENDIX B: OPERATIONAL ANALYSIS

Figure 3: Individual Session Time Plots for Wind Speed (Meters/Sec)

Session 4



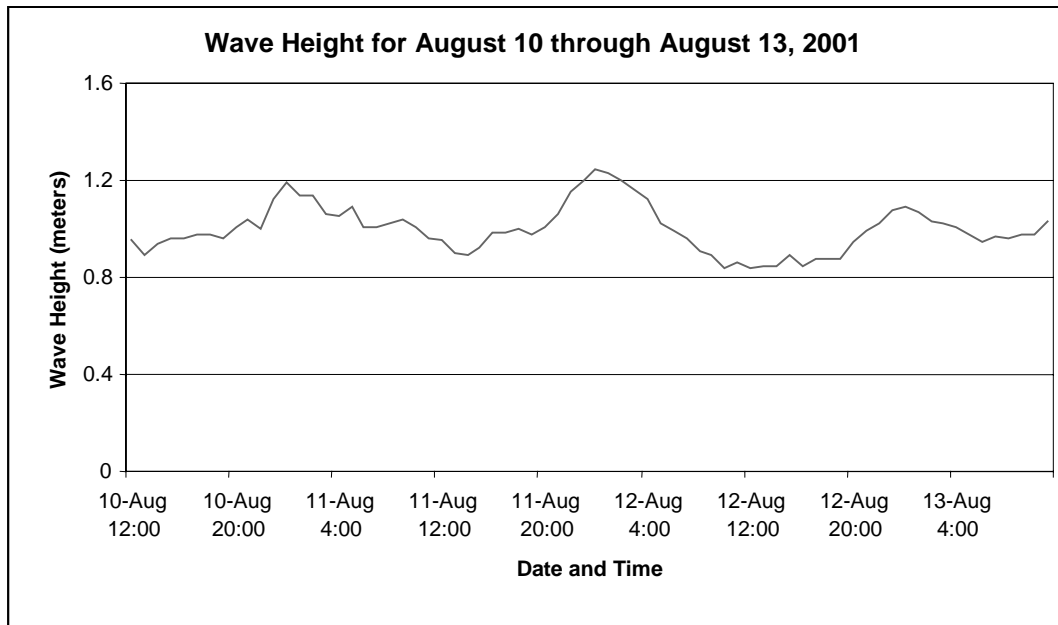
Session 5



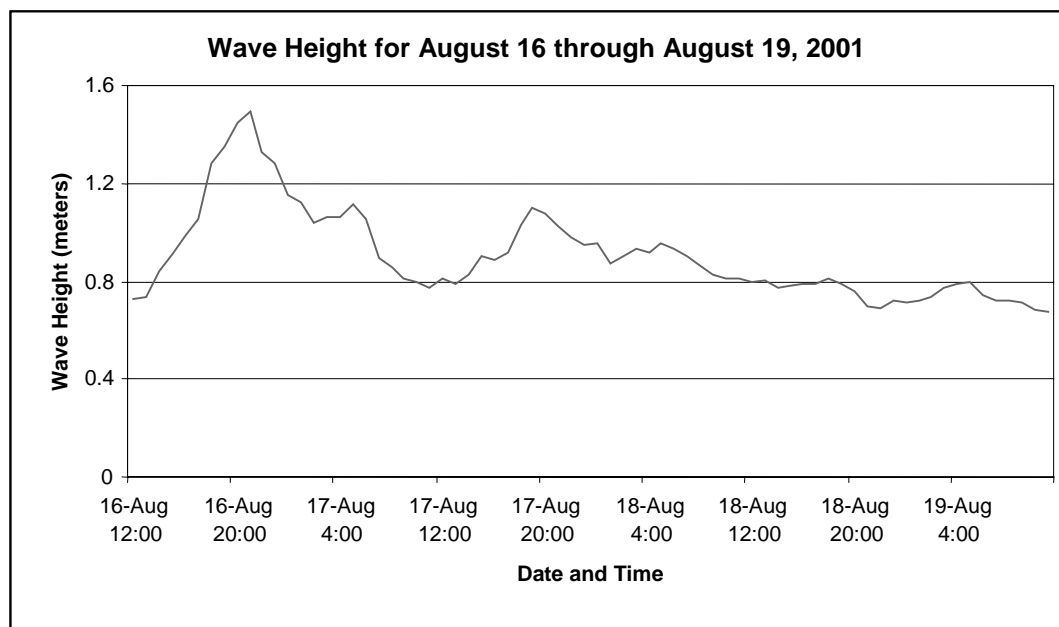
APPENDIX B: OPERATIONAL ANALYSIS

Figure 4: Individual Session Time Plots for Wave Height (meters)

Session 4



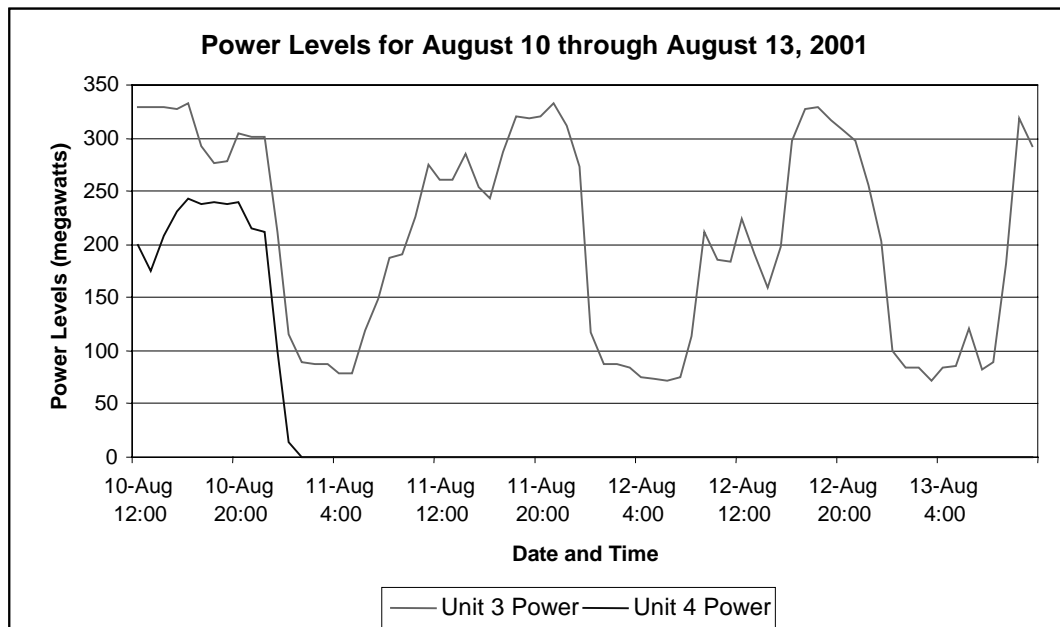
Session 5



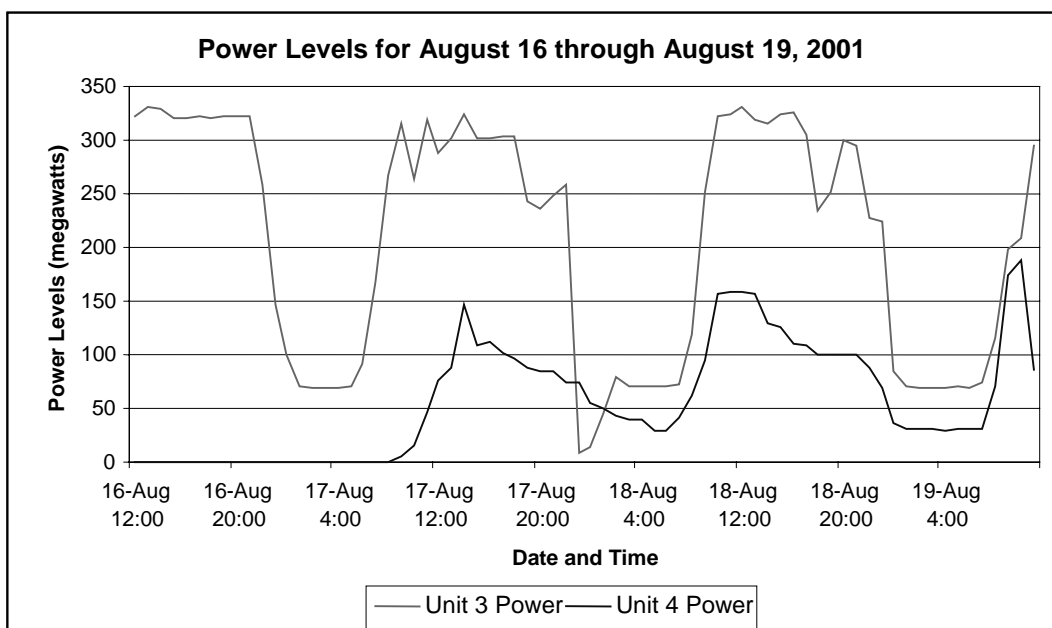
APPENDIX B: OPERATIONAL ANALYSIS

Figure 5: Individual Session Time Plots for Power Levels (megawatts)

Session 4



Session 5

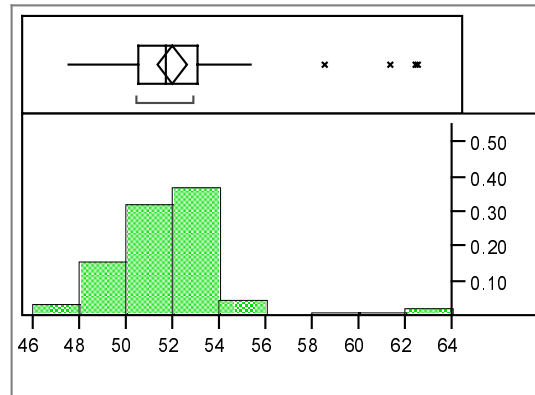


APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 3. OPERATIONAL SUMMARY STATISTICS AND ANOVAs

APPENDIX B: OPERATIONAL ANALYSIS

Figure 1: Summary Statistics for Lav (dBA) at Ref 2 with Unit 4 Operating

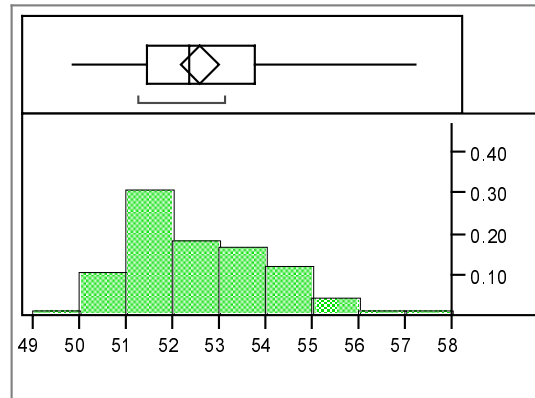


Quantiles		
maximum	100.0%	62.55
	99.5%	62.55
	97.5%	62.45
	90.0%	54.26
	75.0%	53.09
quartile	50.0%	51.75
quartile	25.0%	50.57
	10.0%	49.34
	2.5%	47.70
	0.5%	47.60
minimum	0.0%	47.60

Moments	
Mean	52.02
Std Dev	2.78
Std Error Mean	0.31
Upper 95% Mean	52.64
Lower 95% Mean	51.40
N	80.00
Sum Weights	80.00
Sum	4161.62
Variance	7.71
Skewness	1.82
Kurtosis	5.22
CV	5.34

APPENDIX B: OPERATIONAL ANALYSIS

Figure 2: Summary Statistics for Lav (dBA) at Ref 2 with Unit 4 Shutdown

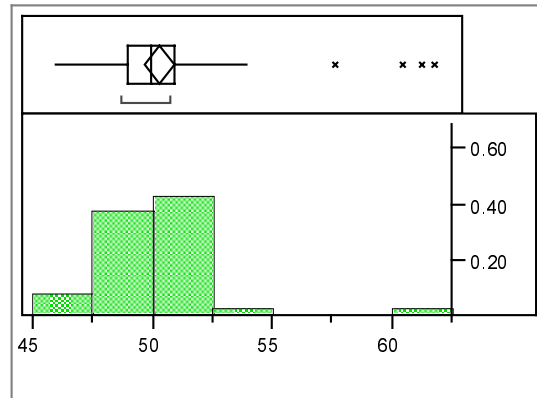


Quantiles		
maximum	100.0%	57.25
	99.5%	57.25
	97.5%	56.89
	90.0%	54.95
quartile	75.0%	53.78
median	50.0%	52.38
quartile	25.0%	51.46
	10.0%	50.53
	2.5%	50.06
minimum	0.5%	49.87
	0.0%	49.87

Moments	
Mean	52.62
Std Dev	1.64
Std Error Mean	0.20
Upper 95% Mean	53.02
Lower 95% Mean	52.21
N	64.00
Sum Weights	64.00
Sum	3367.38
Variance	2.69
Skewness	0.66
Kurtosis	0.11
CV	3.12

APPENDIX B: OPERATIONAL ANALYSIS

Figure 3: Summary Statistics for L50 (dBA) at Ref 2 with Unit 4 Operating

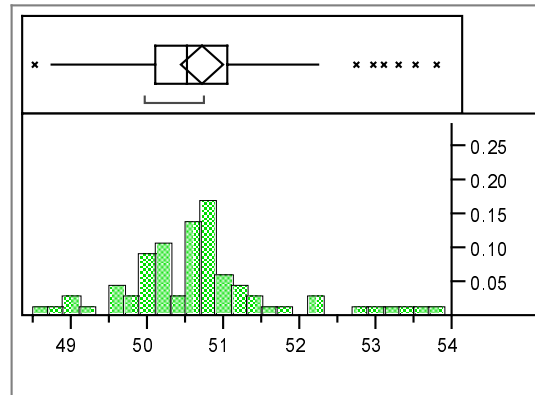


Quantiles		
maximum	100.0%	61.82
	99.5%	61.82
	97.5%	61.29
	90.0%	52.22
	75.0%	51.00
quartile	50.0%	50.00
quartile	25.0%	49.00
	10.0%	47.79
	2.5%	47.00
	0.5%	46.00
minimum	0.0%	46.00

Moments	
Mean	50.38
Std Dev	2.76
Std Error Mean	0.31
Upper 95% Mean	50.99
Lower 95% Mean	49.76
N	80.00
Sum Weights	80.00
Sum	4030.39
Variance	7.63
Skewness	2.42
Kurtosis	7.75
CV	5.48

APPENDIX B: OPERATIONAL ANALYSIS

Figure 4: Summary Statistics for L50 (dBA) at Ref 2 with Unit 4 Shutdown

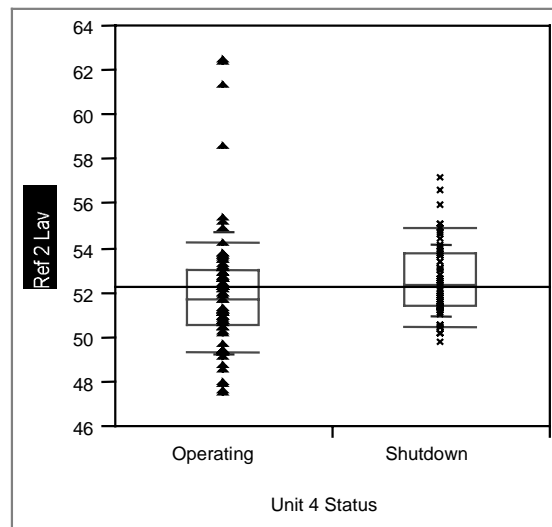


Quantiles		
maximum	100.0%	53.83
	99.5%	53.83
	97.5%	53.64
	90.0%	52.52
	75.0%	51.06
quartile	50.0%	50.53
quartile	25.0%	50.11
	10.0%	49.53
	2.5%	48.68
minimum	0.5%	48.53
	0.0%	48.53

Moments	
Mean	50.73
Std Dev	1.10
Std Error Mean	0.14
Upper 95% Mean	51.01
Lower 95% Mean	50.46
N	64.00
Sum Weights	64.00
Sum	3246.91
Variance	1.20
Skewness	0.88
Kurtosis	1.17
CV	2.16

APPENDIX B: OPERATIONAL ANALYSIS

Figure 5: ANOVA for Lav (dBA) at Ref 2 for the Two Unit 4 Operating Conditions



Level	Quantiles						maximum
	minimum	10.0%	25.0%	median	75.0%	90.0%	
Operating	47.60	49.34	50.57	51.746	53.10	54.26	62.55
Shutdown	49.87	50.53	51.46	52.38	53.78	54.95	57.25

Oneway Anova Summary of Fit

RSquare	0.02
RSquare Adj	0.01
Root Mean Square Error	2.34
Mean of Response	52.28
Observations (or Sum Wgts)	144.00

t-Test

	Difference	t-Test	DF	Prob> t
Estimate	-0.59505	-1.515	142	0.1319
Std Error	0.39272			
Lower 95%	-1.37138			
Upper 95%	0.18128			

Assuming equal variances

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	12.58962	12.5896	2.2959
Error	142	778.66691	5.4836	Prob>F
C Total	143	791.25653	5.5333	0.1319

Means for Oneway Anova

Level	Number	Mean	Std Error
Operating	80	52.0202	0.26181
Shutdown	64	52.6152	0.29271

Std Error uses a pooled estimate of error variance

APPENDIX B: OPERATIONAL ANALYSIS

Means and Std Deviations				
Level	Number	Mean	Std Dev	Std Err Mean
Operating	80	52.0202	2.77699	0.31048
Shutdown	64	52.6152	1.64000	0.20500

Means Comparisons		
Dif=Mean[i]-Mean[j]	Shutdown	Operating
Shutdown	0.000000	0.595049
Operating	-0.59505	0.000000

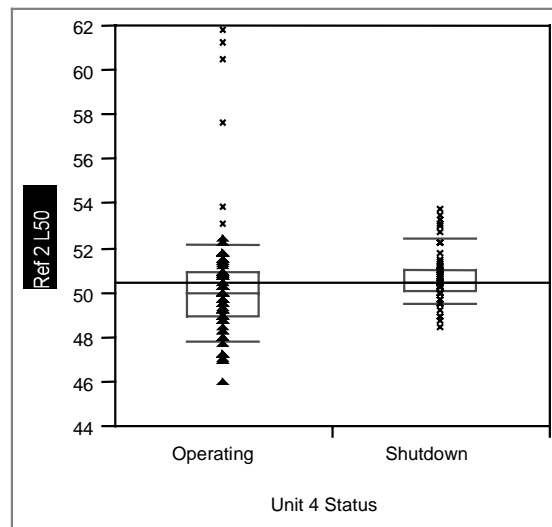
Alpha= 0.05
 Comparisons for each pair using Student's t

t		
1.97683		
Abs(Dif)-LSD	Shutdown	Operating
Shutdown	-0.81833	-0.18128
Operating	-0.18128	-0.73193

Positive values show pairs of means that are significantly different.

APPENDIX B: OPERATIONAL ANALYSIS

Figure 6: ANOVA for L50 (dBA) at Ref 2 for the Two Unit 4 Operating Conditions



Level	minimum	10.0%	Quantiles 25.0%	median	75.0%	90.0%	maximum
Operating	46	47.79	49	50	51	52.22	61.82
Shutdown	48.53	49.53	50.11	50.53	51.06	52.52	53.83

Oneway Anova Summary of Fit

RSquare	0.006491
RSquare Adj	-0.00051
Root Mean Square Error	2.186495
Mean of Response	50.53679
Observations (or Sum Wgts)	144

t-Test

	Difference	t-Test	DF	Prob> t
Estimate	-0.35318	-0.963	142	0.3371
Std Error	0.36669			
Lower 95%	-1.07805			
Upper 95%	0.37170			

Assuming equal variances

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	4.43499	4.43499	0.9277
Error	142	678.86785	4.78076	Prob>F
C Total	143	683.30283	4.77834	0.3371

Means for Oneway Anova

Level	Number	Mean	Std Error
Operating	80	50.3798	0.24446
Shutdown	64	50.7330	0.27331

Std Error uses a pooled estimate of error variance

APPENDIX B: OPERATIONAL ANALYSIS

Level	Means and Std Deviations			Std Err Mean
	Number	Mean	Std Dev	
Operating	80	50.3798	2.76287	0.30890
Shutdown	64	50.7330	1.09708	0.13714

Means Comparisons		
Dif=Mean[i]-Mean[j]	Shutdown	Operating
Shutdown	0.000000	0.353177
Operating	-0.35318	0.000000

Alpha= 0.05
 Comparisons for each pair using Student's t

Abs(Dif)-LSD	t	
	Shutdown	Operating
Shutdown	-0.76409	-0.3717
Operating	-0.3717	-0.68342

Positive values show pairs of means that are significantly different.

APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 4. CORRELATION MATRIX

APPENDIX B: OPERATIONAL ANALYSIS

Figure 1: Correlation Matrix for the Operations Model Variables.

Variable	Ref 2 Lav	Tide	Wind (m/s)	Wave Height (m)	Unit 3 Power	Block 1	Block 2	Block 3	Block 4	Block 5	Unit 4 Status
Ref 2 Lav	1.000										
Tide	0.007	1.000									
Wind (m/s)	0.264	0.367	1.000								
Wave Height (m)	0.230	-0.022	-0.148	1.000							
Unit 3 Power	0.145	0.470	0.667	-0.117	1.000						
Block 1	-0.164	-0.384	-0.348	0.207	-0.552	1.000					
Block 2	0.008	-0.260	-0.403	0.022	-0.525	-0.200	1.000				
Block 3	0.065	0.098	-0.052	-0.246	0.087	-0.200	-0.200	1.000			
Block 4	0.189	0.096	0.539	-0.278	0.358	-0.200	-0.200	-0.200	1.000		
Block 5	0.064	0.370	0.488	0.029	0.398	-0.200	-0.200	-0.200	-0.200	1.000	
Unit 4 Status	-0.126	-0.067	-0.199	-0.359	-0.108	0.100	0.100	-0.050	-0.050	-0.050	1.000

APPENDIX B: OPERATIONAL ANALYSIS

ATTACHMENT 5. OPERATIONAL MODEL

APPENDIX B: OPERATIONAL ANALYSIS

Figure 1: Operational Model

Response: Ref 2 Lav

Summary of Fit

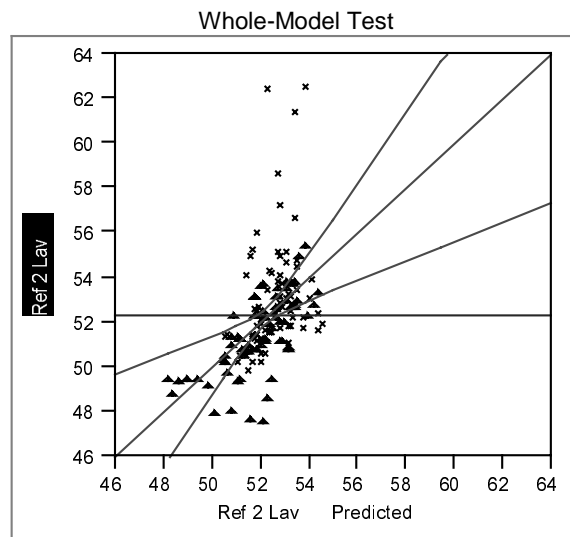
RSquare	0.27
RSquare Adj	0.22
Root Mean Square Error	2.07
Mean of Response	52.28
Observations (or Sum Wgts)	144.00

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob> t	Std Beta
Intercept	47.80	1.52	31.51	<.0001	0.000
Tide	-0.73	0.42	-1.71	0.0896	-0.144
Wind (m/s)	0.22	0.15	1.47	0.1428	0.208
Wave Height (m)	7.36	1.40	5.25	<.0001	0.489
Block 2[0-1]	-0.72	0.27	-2.72	0.0074	-0.230
Block 3[0-1]	-1.20	0.31	-3.89	0.0002	-0.382
Block 4[0-1]	-1.24	0.43	-2.89	0.0045	-0.396
Block 5[0-1]	-0.66	0.41	-1.61	0.1098	-0.208
Status n[0-1]	-0.25	0.20	-1.28	0.2022	-0.108

Effect Test

Source	Nparm	DF	Sum of Squares	F Ratio	Prob>F
Tide	1	1	12.55144	2.9234	0.0896
Wind (m/s)	1	1	9.32646	2.1723	0.1428
Wave Height (m)	1	1	118.51590	27.6043	<.0001
Block 2	1	1	31.73565	7.3918	0.0074
Block 3	1	1	65.02597	15.1456	0.0002
Block 4	1	1	35.88473	8.3581	0.0045
Block 5	1	1	11.12501	2.5912	0.1098
Status new	1	1	7.05264	1.6427	0.2022



APPENDIX B: OPERATIONAL ANALYSIS

Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Ratio
Model	8	211.64976	26.4562	6.1621
Error	135	579.60677	4.2934	Prob>F
C Total	143	791.25653		<.0001

Tide				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
12.551442	2.9234	1	0.0896	

Wind (m/s)				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
9.3264553	2.1723	1	0.1428	

Wave Height (m)				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
118.51590	27.6043	1	<.0001	

Block 2				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
31.735653	7.3918	1	0.0074	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	54.08249159	0.6666491758	52.2760
1	55.53134844	0.8757087988	52.3277

Block 3				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
65.025970	15.1456	1	0.0002	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	53.60529673	0.5428812889	52.2169
1	56.00854330	0.9824666033	52.6233

Block 4				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
35.884728	8.3581	1	0.0045	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	53.56280455	0.435738688	52.0867
1	56.05103547	1.117943889	53.2745

Block 5				
Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
11.125008	2.5912	1	0.1098	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	54.15136785	0.458497917	52.2176

APPENDIX B: OPERATIONAL ANALYSIS

1	55.46247218	1.091224274	52.6197
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Status new Effect Test				
Sum of Squares	F Ratio	DF	Prob>F	
7.0526363	1.6427	1	0.2022	

Least Squares Means			
Level	Least Sq Mean	Std Error	Mean
0	54.55298757	0.7486773173	52.6152
1	55.06085245	0.7663435051	52.0202